Appropriate Technology for Primary Health Care

Indian Council of Medical Research
New Delhi

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Appropriate Technology for Primary Health Care

Proceedings of the National Workshop on Appropriate Technology for Primary Health Care held at the Indian Council of Medical Research, New Delhi (April 23-26, 1981)

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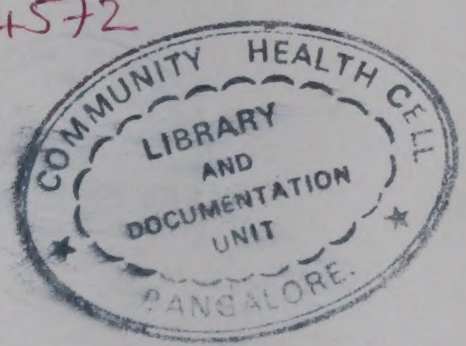

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Welcome address

Professor V. Ramalingaswami

Director-General
Indian Council of Medical Research, New Delhi

There are two features of this workshop to which I would like to draw attention. Firstly, we have had a wonderful response from all those whom we had invited to participate in the Conference and practically everyone accepted and a majority have already turned in their manuscripts. This is something that organisers of conferences and workshops would envy. Secondly, there is an exhibition running side by side with the Workshop in which the methods, tools and techniques that constitute the nuts and bolts of Appropriate Technology are exhibited. In fact it is around what is shown in the Exhibition that our discussions will centre. I am quite certain that generalities and rhetoric, which normally dominate in meetings of this type, would be reduced to a minimum.

A word about what this Workshop is all about. The main purpose is to get a 'feel' of what is going on in the country in the field of appropriate technology for primary health care, to understand what the gaps and problems are, to coordinate efforts in this area in preparing for the future. There are many different views of appropriate technology; at this meeting we would not be indulging in semantics and definitions. Nevertheless, it is necessary for us to have a picture of what appropriate technology and primary health care generally stand for. To my way of thinking, appropriate technology is a combination of social imagination and technology innovation. So far as primary health care is concerned, I regard it essentially as human care, care that is continuous, close to the people and comprehensive in nature with a special focus on the underprivileged and disadvantaged sections of society.

Both in appropriate technology and primary health care, people are central. There is a tendency for regarding people as passive recipients of health care. This must change to an active participation of people. Indeed, we must achieve community action involving self-help, self-care and self-coping in matters of health. It is most important that in the process of using appropriate technologies, there should be no erosion of human dignity and human values.

Primary health care is not a shibboleth. It is a dynamic approach, it is a developmental approach in which health is an integral part of socio-economic development process. The challenge before us is how to establish meaningful

bridges across different sectors of development. We must at the same time demolish the walls of Jericho that separate them at the present time. Indeed, appropriate technology can be that bridge across different sectors of development.

I would like to welcome Shri B. Shankaranand, Union Minister for Health and Family Welfare and President of the ICMR, who is a strong supporter of research as a major instrument for improving our health care services and who has given us maximum possible encouragement. We are delighted that representatives of the South-East Asian Regional Office (SEARO) of the WHO, Dr D.A.W. Nugent and Dr G.S. Mutalik and the Regional Director of the UNICEF, Mr D.P. Haxton are with us at this function, and will be participating in the proceedings. We are very pleased to have with us Professor Amulya Reddy, Head, Cell for Application of Science and Technology to Rural Area (ASTRA), Indian Institute of Science, Bangalore, and Dr Katherine Elliott of the Ciba Foundation and President of the Appropriate Health Resources and Technology Action Group (AHRTAG), London. Both of them will give key-note Addresses to set the pace for the conference. We welcome the participation of Miss Helen Ohlin of the SIDA. It is a matter of great joy to have Dr C.G. Pandit with us; all that we see today around us as the work of the ICMR is really his creation.

Many persons and organisations have helped us in this workshop and its mission. The SEARO of the WHO has not only given financial help but also provided us with the services of Dr Elliott. The Central Health Education Bureau, Appropriate Health Resources and Technology Action Group (AHRTAG), the All India Institute of Medical Sciences, the Sawai Madho Singh Medical College, Jaipur, the Postgraduate Institute of Medical Education and Research, Chandigarh, the Institute of Pathology and the National Institute of Nutrition of the ICMR have rendered valuable assistance in many ways.

I would like to pay a special tribute to Dr (Mrs) Monica Sharma of the ICMR who has carried the brunt of the work connected with the organisation of the workshop and the exhibition. She was ably assisted by my colleagues in the ICMR belonging to both the technical and administrative divisions from all levels. It has been a real pleasure to see such a fine team work.

Remarks

Dr. D.A.W. Nugent

WHO Representative
Ministry of Health and Family Welfare, New Delhi

I thank you for giving me the opportunity of being with you during this very important workshop. As recently as the end of last month *i.e.* March, a seminar on this subject was held in the WHO Regional Office in Delhi, but I would venture to say that, this Workshop, because it is a *National* one, is of greater significance. This is highlighted by the presence of the Hon'ble Minister of Health himself.

It is timely that we have a Workshop on Appropriate Technology for Primary Health Care, because, apart from its importance, there is a danger that the expression 'Appropriate Technology' may become something of a 'catch phrase', which could also apply to Health for All by 2000. Further, it is desirable that the meaning of 'Appropriate Technology' be clear to all of us.

The remarks that follow apply to technology, generally, but the same observations can be made on health. It has come to be recognised that the kind of technology a country adopts can profoundly affect its entire society, the employment available, distribution of income, and the opportunities for skilled and unskilled workers. Until recently, the only point considered by developing countries was 'Is this the best and the most modern available?' The echnology was usually Western, designed for large home markets or well developed export markets and labour saving. In the context of unemployment or under-employment and small home markets due to lack of purchasing power in the masses, this technology was highly inappropriate and often put out of work more people than it employed. The concept of appropriate technology, if not the name, originated with Gandhiji, who saw as early as 1920 what Western technology was doing to enhance unemployment and rural poverty—and so he started the cottage industries programme. Others developed the idea further at a later date, realizing that appropriate technology had to be an improvement on traditional methods.

How then may we best describe appropriate technology? Appropriate technology means, simply, any technology that makes the most economical use of a country's natural resources and its relative proportion, of capital, labour and skills—and that contributes to national and social goals. Where machinery and/or equipment is involved, it should be simple to run and repair. It should be locally produced as far as possible.

It does not require any great depth of understanding to apply these general precepts to the field of health—and from there to the area of Primary Health Care. We hope in the discussions that follow in the days we are together, useful examples and guidelines of benefit to the country, will emerge.

Remarks

Dr G.S. Mutalik

Director, Comprehensive Health Services
World Health Organization, New Delhi

I have great pleasure in joining Dr Desmond Nugent, WHO Programme Coordinator, India, in bringing you the greetings of the Regional Director and of colleagues in the Regional Office for the success of this important Workshop. We in the World Health Organisation in this region are deeply interested in this subject, and in fact, in the recent past there have been two important meetings related to appropriate technology for health—'Regional Meeting on Appropriate Technology for Health in relation to Primary Health Care', New Delhi 20-24 October 1980 and 'Inter-regional Workshop on Appropriate Technology for Health, New Delhi, 24-31 March 1981. We were happy to say that Dr Ramalingaswami and other participants from India greatly enriched these meetings with their contributions. We eagerly look forward to the deliberations here as a contribution to an intercountry programme and to the unique and diverse national setting.

This important activity is taking place at the most opportune time when India along with other member states has completed the first phase of formulation of strategies for attainment of Health for All by the Year 2000 and is now engaged in detailed formulation of an action programme in keeping with the long term perspective plans and the recently formed Sixth Five Year Plan. Having identified the health priorities derived from rational health policies, the time now is to concentrate on the tools for the delivery of primary health care for the people and by the people themselves. This is where appropriate technology comes in as a relevant topic. Primary health care as conceived at Alma Ata, Mr Chairman, is a vital, dynamic and sustained upward movement within the community for betterment of the quality of life of its members, which derives crucial support from the interfacing social sector plans and service programmes of the Government and development activities of non-governmental organisations. In India, the primary health care movement has already taken deep roots and in fact, this has been the country where numerous innovative experiments involving communities for providing alternative means of fulfilling their basic health needs have contributed to the emergence of the very concept of primary health care which was crystalised subsequently at Alma Ata. We are very happy to see in this hall some of the pioneers who undertook these innovative experiments. We therefore keenly look forward to the outcome of this important meeting.

Though appropriate technology relates to appropriate use and application of tools, the main focus has to be on the people for whom it is meant. The concept of A.T.H. has to merge with other important social dimensions—its capacity to generate employment, reduce poverty, besides helping to solve technical problems. It is in this context that many appropriately related facets of primary health care are going to be discussed in this workshop. We from the Regional Office wish to assure you, Sir, that WHO will endeavour to provide continued support for the success of primary health care, using appropriate technology in this country which comprises 60 per cent of the population of this entire region.

Remarks

Mr David P. Haxton

Regional Director
UNICEF, South Central Asia, New Delhi

At the risk of repetition, I would like to say that primary health care for all children, is a central part of UNICEF's mandate. And, as I shall try to show, appropriate technology is one of the main means of fulfilling the UNICEF's mission. I am naturally pleased at the opportunity to participate in this workshop organised by the Indian Council of Medical Research. I cannot think of a national institution more appropriate than the ICMR to go into the topic before us today.

Our common concern and aim is to give substance to the declaration of Alma Ata, which UNICEF was privileged to sponsor jointly with WHO nearly three years ago. The key to the right approach to this task is found in the declaration itself : Primary health care is, to quote its words, to be 'based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community, and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination. Here then, is a set of criteria to identify or develop technology appropriate to particular social contexts.

Let us remember that we are searching for a health delivery system appropriate to the situation but which is not considered 'second class'. What we need today is in fact a technology that would help initiate a process of human development by stimulating the innovative forces which exist in any community. We in UNICEF have another name for this approach—the 'basic services strategy'. Its essential feature is community involvement and community responsibility. It answers the economic quandary of governments being financially unable to extend the conventional pattern of services to all the people. It also meets the problem of professional disinclination to go and live or work among people in the village or urban slum. And finally, it preserves human dignity by making people, in their families and communities, feel that they can assume the responsibility of looking after their basic needs—given the right kind of knowledge. Nowhere is the basic services strategy more convincingly appropriate than in the context of primary health care.

I am glad that this workshop will be concerned not with the ideological debate on appropriate technology that has gone on for about two decades now, but with

the practical issues of defining and applying appropriate technology for primary health care.

I would, therefore, briefly cite a few examples to make the point that we need to remove obstacles that stand in the way of technology appropriate to primary health care.

We all know, for example, that nothing is more appropriate to infant and early childhood nutrition than breast-feeding. All the same, breast-feeding is declining even in developing countries and bottle feeding is increasingly the fashion and the bane. This is mainly because the facility of the health care system is being systematically misused for promoting what are called breast-milk substitutes. Often, personnel provided or paid for by manufacturers or distributors of infant formula operate openly through the health care system. The Draft International Code of Marketing of Breast-milk Substitutes, coming up before the World Health Assembly next month, will have to be taken up at the national level for effective regulatory action by the force of public opinion as well as of the law—in the interests of appropriate health technology. This will have implications in health education, present hospital post-delivery practices, and in training at all levels.

Appropriate technologies do not exist in isolation. For instance, the growth chart and oral re-hydration salts are linked to one another and indeed to several other technologies in primary child care. It would therefore be a waste of opportunity to promote appropriate technologies singly. They would have to be promoted in careful clusters for such substantial fields like primary child care and primary mother care.

Let me give you an example nearer home. I am told that when people migrate from neighbouring states to settle in the suburbs of Delhi, they take care to plant a pomegranate tree in their modest courtyard—they believe this to be a reliable source of treatment for diarrhoea. Has the medical profession and its research arm evaluated and promoted the use of this simple intervention ? India is full of such promises not only in the curative field, but also in promotive and preventive possibilities. I understand that, back in the 1930's, Mahatma Gandhi used to propagate through his journal the virtue in eating unpolished rice, using neem leaves for eyes, charcoal for dentifrice and oilcake for bath, perhaps to the amusement of others. Each such traditional idea was subjected to informed scrutiny and sought to be promoted as part of a nation-wide effort at social change.

It is not enough to lay down what is appropriate technology or even the criteria to judge how appropriate it is; the ultimate decision rests with the user. Our task is to provide people with the correct information and to see that nothing blocks the way of their making the most of it. The dissemination of the relevant facts is an important precondition to making public property of every appropriate technology.

Appropriate technology—whether it involves reviving a traditional technology improving an old one, adapting a current technology, or inventing a new one—

must acquire the makings of a national movement. I believe this is both possible and necessary.

UNICEF awaits with keen interest the outcome of your discussions. It stands as ready as always to assist in promoting the understanding and application of technology appropriate to situations in which children and their families find themselves.

Inaugural address

Shri B. Shankaranand

Minister of Health and Family Welfare, New Delhi

This is, I believe, the first National Conference of its kind dealing with Appropriate Technology for Primary Health Care. I would like to compliment the Indian Council of Medical Research for the initiative they have taken in this regard. As you are aware, India is a staunch supporter of the Alma Ata Declaration for the achievement of the goal of 'Health for all by year 2000' through the primary health care approach. Appropriate technology is an essential component of primary health care in all its eight dimensions.

The concept and limits of appropriate technology have been the subject of much discussion. We in this country view it as a set of methods, techniques, means, tools and equipment which are employed, with active community involvement, to provide effective health care to the people. Furthermore, the care provided should be accessible to all especially to the poorest segments of the population. It must rest on scientific foundation, it must be acceptable to the social and cultural styles of the people and it must be of sufficiently low cost. What it is not, has been beautifully stated by Dr Mahler, "It is not cheap and primitive technology for poor and primitive people".

As the Director-General, ICMR, has said, considerable amount of work is being done in our country in the field of appropriate technologies for health. There is a need to coordinate all the efforts that are being made, to prepare a national plan for the further development of appropriate technologies and to identify specific goals on a priority basis to help in the speedy achievement of primary health care throughout the country. Primary health care constitutes the foundation of our National Health Policy which is in the process of finalisation and the Sixth Five Year Plan gives a prominent place to appropriate technology as an instrument for the achievement of our health goals.

There has to be proper organisational support for appropriate technology and there is a need for a focal point within the country for the promotion of appropriate technology activities. The Government are of the view that the ICMR should be designated as the national focal point for this purpose. I am also thinking of setting up a National Committee for Appropriate Technologies for Health. These steps would ensure intersectoral coordination at all levels and assist in developing a net work of collaborating centres for appropriate technology

throughout the country and provide the necessary technological back-up support to the national health services. There is also a need to develop a proper information systems for appropriate technologies. Such a system would prepare an inventory of appropriate technologies that are now available, evaluate the technologies that have so far been developed with regard to their effectiveness, identify the gaps in our technological reportoire and take such other steps as to promote the discovery of new technologies for the promotion of primary health care. Workshops, seminars and exhibitions of the type that you have organised today will go a long way in spreading the message of appropriate technology.

I would like to compliment the organisers of the Conference for devoting the very first session of this workshop to the problems of the handicapped and rehabilitation technologies in this year of the disabled. These problems generally gets relegated to an insignificant position in conferences on health care. In your deliberations you will, I am sure, be discussing a number of aspects of appropriate technology, but I would like to emphasize the importance of utilising in the maximum possible way the local manpower capabilities and the locally available resources. At the same time, whatever is appropriate in the indigenous technologies that are still in vogue in the rural areas must be saved from destruction.

But technology alone cannot solve our problems. If this were so, we should have by this time achieved the goal of health for all. The available technologies must be coupled with a sound system of organisational and managerial practices and social innovation. A great deal of communication skill is also involved in the utilisation of known technologies. Appropriate technology is not just gadgetry but it embraces the most appropriate forms of organisation of health care in the country which is in tune with the cultural and social aspirations of the people.

Health manpower development impinges upon several aspects of appropriate technology which, I am glad to see, is reflected in your programme. We in this country have embarked upon the provision of primary health care through the development of a vast net-work of auxiliaries and community health workers who are supported by the higher levels of health care through professional back-up services. So far 150,000 community health volunteers have already been trained and are working in an equal number of villages. We hope that by the end of the Sixth Five Year Plan, we would be able to train and put in position 360,000 community health volunteers This is the single most daring step that has been taken by the Government towards the achievement of health for all through the primary health care approach. The training of these workers and their re-training in the form of continuing education require appropriate technological inputs.

The ICMR has pioneered the development of low cost audio-visual and learning materials suitable for the education and training of various levels of health workers.

We are placing the maximum possible emphasis upon the control of communicable diseases, the improvement of

maternal and child health and the enhanced use of contraceptive technologies within the framework of health care services to bring down birth rates as rapidly as possible. In this connection, I would like to plead for special attention to be given by the appropriate technology movement to the special needs of women. Technology should not displace women from earning position. On the contrary, appropriate technologies should provide enhanced opportunities for women to work and earn and support them in every possible way to improve their status in society.

Just like primary health care, appropriate technology must adopt an egalitarian approach. We should not fall into the trap of developing appropriate technologies which are useful to the top few but inappropriate for the bottom many.

In the end I hope that the development of appropriate technology in our country and in the developing countries as a whole will lead to a reduction in the dependence of developing countries on developed countries and that such dependence will be replaced by mutual collaboration in a joint endeavour. Developing countries cannot be playing second fiddle all the time.

I have great pleasure in inaugurating the National Workshop on Appropriate Technology for Primary Health Care.

The exhibition

The Indian Council of Medical Research is keenly aware of the vital necessity of supporting and promoting primary health care. In a country like ours, with limited resources and innumerable health problems, integrated approaches for raising the health status of the community are essential. Community participation is an essential tool in software for primary health care. Innovative and scientifically sound, low-cost equipment is a vital component of hardware. With these and other relevant factors in mind, a National Workshop, and an Exhibition on Appropriate Technology for Primary Health Care, were organized. The exhibition displayed some of the technologies which have been developed by scientists in different fields of health care. The use of such material would be of immense value in delivering adequate health care to the community. The Council has highlighted aids developed for rehabilitation of the physically handicapped in this 'Year of the disabled'. These are very simple, low-cost aids which can be used in primary health care, are adapted for the Indian way of life, and may therefore be accepted by our people.

The Department of Rehabilitation and Artificial Limbs, All India Institute of Medical Sciences, has developed several simple aids for the physically handicapped. Exhibits in the field of occupational therapy displayed were several wooden appliances used as mobility aids, special chairs for young children with cerebral palsy and splints for the support of weak limbs. Artificial limbs have been designed at the Department, keeping in view the requirements of the Indian. The above-knee modular prosthesis which allows squatting and cross-legged sitting and below knee modular prosthesis allowing squatting are the first of its kind in the world. These designs have been patented.

Several rehabilitation aids have been designed by the Rehabilitation Research Regional Limb Fitting Centre, Sawai Madho Singh Medical College, Jaipur. Local artisans have developed many aids which were displayed, such as artificial limbs, like the Jaipur foot, below knee and above knee metal limbs, and low-cost calipers for paralytic lower limbs. Photographs showing these appliances in actual use by rural patients were exhibited.

The Department of Community Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh is interested in developing low-cost teaching material and equipment, both for the community, as well as for health personnel. Special areas of interest are health education, developing simple visual aids or health workers, low-cost equipment for primary health care and simple recording and information systems. Some examples were shown.

The Voluntary Health Services exhibited a few charts illustrating the concept

primary health care through Mini Health Centres.

The Appropriate Health Resources and Technologies Action Group Ltd. (AHRTAG) is concerned with the development of equipment and techniques for health care at community level. It also provides an information service on appropriate technology for primary health care. Special areas of interest include : the cold chain diarrhoeal diseases, dental health care, disability prevention and rehabilitation. Information about these subjects were exhibited.

The Central Health Education Bureau designed an exhibition on 'Health for all by 2000 A.D.' Through attractive photographs, charts and models, the exhibition highlighted the measures being taken by the government in the field of health. The exhibition focused on preventive and promotive activities, cummunicable disease control, malnutrition, maternal and child care, family planning and community participation.

Prevention of blindness among young children is an important component of primary health care. Vitamin A deficiency is a serious problem in our country. The National Institute of Nutrition has pioneered research in this area and has promoted a national programme for giving large doses of vitamin A to preschool children to help prevent blindness. The Institute is also interested in educating the community in the use of locally available foods in vitamin A. The exhibits highlighted these points.

The National Institute of Nutrition at Hyderabad has been interested for some time in the delivery of nutrition services through the community and in the development of low-cost recipes using locally available familiar foods. The exhibits focused on community participation in feeding programmes, low cost recipes, ingredients and methods of preparation, and costing.

The Institute of Pathology is intimately associated with the dissemination of medical and health educational and training materials. It developed comprehensive indigenous technology for the mass production of low cost audio-visual teaching aids for those in medical and health education at all levels. For example, transparencies have been marketed and distributed widely to medical colleges and Gandhi Memorial Leprosy Foundation. Material relating to the translation of medical knowledge into rural practice (TOMKIRP) and slides of the Helen Keller Incorporated set on Prevention of Nutritional Blindness have been supplied. The Institute has potential to prepare multilingual synchronised slide-tape programmes on any health subject for training health personnel. This appropriate technology is complementary to the synochronised A.V. projector, made and marketed in India by Central Electronics Limited, Sahibadad (U.P.).

The Central Bureau of Health Education, has displayed health education material very innovatively. Attractive models to spread messages such as those against smoking, promotion of nutrition, immunization and others were exhibited. These were constructed and designed by Dr V.M. Bagley.

The Voluntary Health Association of India displayed simple books and very good teaching material for health workers. The emphasis was on teaching material for auxiliaries and low-cost slides for teaching.

Appropriate Technology for Primary Health Care, 1981, pp 15-18

Appropriate technology for rural development

A.K.N. Reddy

Cell for the Application of Science and Technology to Rural Areas
Indian Institute of Science, Bangalore

Appropriate Technology for rural development has two aspects—development in rural areas and symbiotic development in urban areas. Unfortunately, in the recent past there has been an emphasis on the decoupling of rural development from urban development. This should not be the case. The total development process has to have both the urban and rural components, as they are interdependent. For example, a factory which produces ball-bearings or screws in an urban metropolis is as essential for rural development as large health institutions in urban areas to provider eferral services to rural areas, in the sphere of health. These form a part of the total process of health care for the nation.

How would we generate appropriate technology in rural areas? An example is cited. In 1974, a group at the Indian Institute of Science called 'ASTRA', which stands for Application of Science and Technology to Rural Areas, and in Sanskrit means 'Weapon' started working in the rural areas. We found that whilst many of us knew a great deal about heat transfer in missiles and the electrochemistry of fuel cells used in the Apollo series, we knew little about a rural area just ten km outside Bangalore. Gradually we developed a model whereby we identified a target group or in other words the community with whom we were going to interact. The most important step in generating appropriate technology is to identify the felt needs of the community. We strongly feel that the identification of felt needs cannot be done from the cloistered chambers of our large institutions, but can only be done by direct contact with the people. Ideally, social scientists should elicit felt needs of the community. However, they are often reluctant to work in rural areas. Therefore, physical scientists are left to do this exercise. It is very important to remember that in this vital step it is the people who are the teachers and the technical personnel, the students. Other than contact two qualities are required to identify these needs—empathy, and a certain measure of intelligence. We then come to the next step in the process of development of technology. We have to generate a spectrum of technologies to provide a number of technological options. The poor in our country have a difficult choice to make—there are traditional technologies which were optimal in the past but which have ceased to be adequate and the other option of modern technologies which are very expensive and therefore often out of reach. The role of scientists is to generate other options by

which technologies will be more adequate than the traditional and more accessible than the modern.

Having generated these options, the next step is demonstration of these options to the people. After demonstrating these options the decision gravitates to the community so that they choose the technology which is most acceptable to them. There is a distinction between felt needs and perceived needs. I exemplify this by describing the following situations : In a rural area where most houses have thatched roofing the people are aware of all the defects. They say the roofs catch fire, leak, harbour rodents and termites and are difficult to maintain. If one asks them what they want, they invariably want cement-concrete roofs or tiled roofs. The felt need is for better roofs, but the perceived need is for cement concrete roofs or a tiled roofs. That is because they are unaware of other options. We have responsibilities to change this situation where a two option system exists—the traditional and the modern—and develop and generate other technologies.

We have been intimately associated with energy planning. The basic approach required is firstly the elucidation of current energy consumption patterns. The second step is the translation of these patterns into end uses. Then one has to reach these end uses by considering various technological possibilities. Finally, the best option is chosen for implementation. A survey was carried out at Pura village where the energy consumption patterns were studied. This is probably one of the first energy source and energy activity matrices constructed. We have taken into account not only the commercial sources of energy, that is electricity and kerosene, but also the non-commercial sources such as firewood, animal sources and human sources. Various activities have been correlated with energy consumption. The results of this study show that firewood accounts for nearly 90% of the energy sources in village Pura. Commercial sources provided only 3% of the energy requirements. The human sources and animal sources do not contribute much to the energy source. However, in agriculture the bulk of energy required comes from animal sources. When one examines the energy consumed for different activities, it is seen that 90% is used in the domestic sector. The end uses of heating are discussed. The most important activity requiring energy is cooking, with temperatures between 95° and 250°C. The next most important activity is heating bath water which requires about 55°C. There is the requirement for high temperature heating for pottery making, lighting; mobile power for ploughing, and stationary power for water lifting.

Most exercises of energy planning concentrate on inanimate sources. However, human sources can do much to improve the quality of life. Human energy is primarily utilised in the domestic sector and in the agricultural sector. This survey carried out at Pura studied the human energy expenditure for various activities in the households, calculated in hours per year or hours per day. Human energy expenditure of people—men, women and children—were noted. It was found that for men, the energy expenditure was 5·68 hours per day household per day; for women it was 9·69 hours per household per

day and in children it was about 3 hours per household per day. At this point a social scientist, Srilata Batliwala pointed out that this entire exercise was not merely a study of energy but that of health and nutrition. She stated that the usual approaches to improvement in nutrition either involve increasing the food intake or 'plugging the leaky bucket' along with elimination of intestinal parasites. She pointed out that the expenditure of human energy had to be taken into account because if one converts the hours into calories—this is a difficult but conceptually possible exercise—certain conclusions are arrived at. We see that women not only eat last and least but also perform the maximum work.

We may then say that if we could document all the activities, and the calories required, we could analytically build the requirements. The work on energy expenditure raises a very important question—the question of the connection between appropriate technology for energy and appropriate technology for health. If we work on energy technology which reduces unnecessary work or avoidable drudgery then what we are actually doing is cutting down expenditure in terms of calories and making the intake of food have a greater impact on the nutritional status of a person.

One of the energyt echnologies that we have developed is the bio-gas plant. Let us take cooking as an example. We studied the actual life styles of the people and cooking times in the village—how many families cook at what times in the day. We found that the peak cooking hours are between 6 and 10 in the morning and 6 and 9 at night : The time when there is no sun. Such a study prevents us from making alarming mistakes—suggesting solar cooking for these people, for example. When the sun is up, they are out in the fields. Other technologies that we have addressed ourselves too is the supply of water. We saw that the bore wells with the hand pumps installed by the government were not accepted by the people. Water analysis showed us that the total solids is 2200 parts per million in the bore-well and only 170 parts per million in the tank which the villagers have been using traditionally. This would disprove the usual argument that villagers are opposed to any innovation.

The biogas plant that we have installed runs on the output from 150 cattle which produce 1 ton of dung per day which is converted to 1300 cu feet of gas per day. Out of this, 900 cu feet are used for cooking and 400 for operating an engine which lifts the entire water requirement for the village. It can also be used for lighting for few hours and for small industry. While planning for the piping for the biogas plant a detailed simulation plan was drawn up to ensure equity of distribution in different parts of the village so that the rich and the poor could avail of this facility. The water cooling system which was necessary to cool the engine, provided the spin-off benefit of having hot water for the entire village. We have also been using solar heating for the biogas plant. Other technologies which we have explored are energy forests, fast growing trees, and wind mills.

I would like to state what appropriate technology is not. Appropriate technology is not against industrialisa-

tion or against modern technology. It does not represent a return to traditional technology. It is not restricted to production, hardware, and industry, but it also involves products in all sectors such as agriculture, health, communication and others. Appropriate technology is not primitive technology or low technology and does not imply undermining basic research. In fact it emphasises an even greater stress on basic research because in the absence of the beaten western path in conventional technology, there is no alternative but falling back on fundamental research and new insights. It does not concern only with the smaller scale technology as small may not always be beautiful. The optimum is beautiful—the optimum is sometimes small, sometimes medium and in other situations, it is large. I would also like to stress that appropriate technology is not a substitute for the socio-economic changes required for real development. In addition, appropriate technology is not pointless within the present framework of society, because it becomes the key to the transformation of society. And it is not a matter of just experiences or transitory, temporary devices, to cope with the current predicament. It is a crucial part of a new vision.

What is the role of scientists and technologists in appropriate technology? I start with a quotation from the Bible: "Blessed are the poor for they shall inheret the earth". This will happen only if we get people out of the two option trap—the trap of having to rely on traditional technology which is no longer adequate or modern technology which is not accessible. And therefore, the poor will inherit the earth if we generate more options for them. This is where scientists and technologists have a crucial role to play. Their role is to generate a heirarchy of options starting from the traditional options and building up, where increments of investment generate other options which are more cost-effective. So that at any point with a little more investment one will have a costlier technology which gives better performance and people can slot in at any level that they want.

By this kind of work are we abandoning our faith and deviating from our charter? I submit we are doing neither. In the Indian Institute of Science, the charter was clearly spelt out by Jameshedji Tata. He said that he did not want the Indian Institute of Science to be just another University. He wanted the faculty and students to be deeply involved in problems which would lead to the material welfare of India. I am reminded of a Greek mythological figure, Antian who was the strongest man on earth as long as his feet were on the ground. Once we stop looking towards the West for our inspiration and turn tot he vibrant world which surrounds us, we will gain strength—and suprisingly more recognition.

Appropriate Technology for Primary Health Care, 1981 pp 19-26

Appropriate technology for primary health care

Katherine Elliott

The Ciba Foundation, London

This meeting symbolizes the much needed and greatly welcomed change in attitude among the scientific elite over the last decade. Everywhere there is an increased and informed awareness of our urgent obligation to respond to the pressing needs of the greater part of the World's population. We have moved with an alarming speed towards what Teilhard de Chardin called 'the planetisation of man'—thanks to the technological advances which have brought us global travel at supersonic speed and the instant communication, not only of words but of sights[1]. May I remind you of the Elizabethan poet and priest, John Donne's words :

> "No man is an iland, intire of itself;
> every man is a peece of the Continent,
> a part of the maine; ... any man's
> death diminishes me, because I am
> involved in Mankinde; and therefore
> never send to know for whom the
> bell tolls;
> It tolls for thee"[2].

Those words written 400 years ago are even more meaningful today. We now need never to send for the bad news; we can actually watch deaths and disasters happening as we sit comfortably beside our television screens.

But I do not intend to waste your time painting pictures of poverty and underprivilege. We recognize these to be the problems. Nor will I discuss the evils and failures of the past, and the futility of many current and well intentioned development programmes. I believe we all (and this is why we are here) agree that trickle down aid ideas don't work, that there is no universal prescription, no all-purpose panacea to heal the ills of our situation. Hope for the future can be built up only through a steady, albeit slower, bubbling up of confidence among those who live at sheer survival level, confidence that they can themselves bring about their own betterment, that life can indeed be sweeter for them, that half their children need not die unnecessarily. A Chinese proverb says :

> "Many little things
> done in many little places
> by many little people
> can change the face of the world"

This philosophy, I submit, forms the core of all primary health care movements, the placing of trust and of a share of any special expertise some of us may be lucky enough to possess in the hands and the good sense of our only truly plentiful resource, the people themselves.

And let us not delude ourselves that the more prosperous societies are less in need of similar drastic rethinking. In his recent review for nature of the third book in the Schumacher trilogy—'Small is Possible' by George McRobie—Lord Ashby writes :

> "To be without work is as dangerous as to be without love"[3].

All societies have, I believe, a great deal to learn from the experiences of others. I would like here to quote Professor Ramalingaswami's own words at the Royal Society meeting :

> "The rural people are careful, minute observers of Nature. They have intimate knowledge of their environment and are conversant with the soil and the seasons. They know what works and what does not. The essential questions are : How can we learn from them ? How can we involve them[4]"?

My brief for today is to offer ideas about appropriate technology's role in primary health care. Distinguished speakers will be talking about the many aspects of primary health care and, before I finish, I hope to show examples of hardware and software—ideas, techniques and tools—which may contribute to all these aspects according to needs, resources and circumstances. Hardware, in this context, can range from the vaccine refrigerator to the winged bean, which is an underexploited protein source for the wet tropics. Software can range from the promotion of breast-feeding to basic training materials suitable for local adaptation like those developed at Jamkhed, and many other places.

In 1973, which was Human Rights Year, the Ciba Foundation, held a meeting on 'Human Rights in Health'[5]. In a world capable of interplanetary travel and its own self destruction, we felt it was time to consider how to ensure for all children certain birthrights in health. We chose four as the basic minimum : safe water to drink, enough of the right kinds of food to prevent malnutrition; protection against communicable diseases where the knowledge and means already existed; and the right to be wanted children. We discussed the impact meeting these obligations might have and how this might be done, and agreed that Western style high technology, hospital based medical care was not the way. What was so obviously needed was for at least one or two people in every community, every village or neighbourhood, however small, to know enough to keep the faeces out of the drinking water; to know how to make the best use of existing food resources and how to encourage diversification and to prevent deficiency diseases; who could carry out, immunization programmes and supply, for instance, anti-malarial and anti-leprosy drugs,—or who could at least make certain such preventive programmes took place; and who could encourage family spacing and look after supplies of contraceptives. Such people act as *agents of change* within their own communities, knowing where to go for help when needed, giving simple care and health education, and stimulating confidence in the possibility of achieving a better quality of life. Millions of such health care agents were and are clearly needed. I believe that we are only slowly coming to grips with all that is entailed in covering the world, with all its many

remote and forgotten corners, with the properly functioning and properly supported required network of such people.

That was in 1973, and this was not then a new idea. Small community health worker programmes had already existed in scattered places for many years; and we should never forget the wide variety of traditional systems of health care which have much wisdom to offer. But what has so often been lacking is the recognition by conventionally trained health care personnel that there may be diverse routes to the same objective and that, as Professor Rex Fendall says : "Health comes by evolution, not revolution". People treasure their individuality and primary health care, if it is to be successful, must meet the people's needs as they perceive them. It cannot be imposed from outside against their will; nor can almost any other change, as many so-called experts struggling with development aid programmes have begun at least to learn.

> "Health cannot be forced upon the people.
> It cannot be dispensed to the people. They must want it and be prepared to do their share and to cooperate fully in whatever health programme a country develops"[6].

I have, however, been thinking for some time about how technological expertise can best play its part in primary health care programmes. Recently I came up with what I hope is an appropriate analogy which I would like to share with you, because it helped me to see what kind of pattern of resource centres we might plan to set up and how these could perhaps be of some real use.

This analogy seems to me an appropriate one for India with her long tradition of local spinning and weaving, designing and creating the loveliest variety of fine yet durable fabrics. Primary health care, to be successful, must, I suspect, resemble a patchwork cover or quilt. The separate pieces will serve the same purpose of protection against most of the hazards of the environment but their shape, texture, colours, design and materials will be the expression of the communities they shelter. Joined together, the patchwork will come to cover the country, but each piece is likely to look a little different from any other piece. There will nevertheless be certain basic strands recurring in each of the patches, because these are essential to the making of any fabric. In primary health care, water supplies, food, housing, energy needs, birth, medical care, death, social relationships—all these and many others must be included. In any place these strands will, however, need to be spun from a selection of whatever threads are available, either on the spot or brought in from outside, spun and woven according to local tastes and skills, using either traditional techniques or new techniques which have been accepted as improvements.

The appropriate technology movement's task is to know the range of possible threads or fibres that exist or could be invented, and the techniques required to handle them in different situations, and to make this information readily available in ways that can be easily assimilated by ordinary people. As many choices as possible must be on offer, together with people ready to help, if asked, in making and using the choice.

Such helpers should, however, always be aware that the final design must suit the users on the spot because they have to live with it; help to pay for it; use it for their own purposes as they perceive them; keep it in good repair and, if possible, open to further improvement.

Appropriate technology is obviously an interface and transfer activity. We learn from one group and make what we have learnt available to other groups. We transfer the fruits of experiment and experience between different groups —locally, regionally, nationally and internationally. We assist in identifying needs and problems, and if appropriate answers and solutions have not already been recognized somewhere to these needs and problems, we communicate them to people with appropriate expertise and interest to offer, facilitate any needed research and field testing, and help to publicize the resulting new information. We recognize that local experts are the proper people to solve local problems and that, as Professor Reddy stresses, gadgets and devices for Indian villages should not be developed in Western laboratories. Our Group[7] in London regards itself primarily as a clearing house and an information centre. It gives us the greatest satisfaction when we can establish better links between countries for the exchange of well-tried solutions to similar problems. The wheel should not have to be re-invented too many times, but there are many different methods and materials to use in making wheels for a variety of purposes.

It is, important not to ignore the existence of sophisticated technologies which have never been tapped because their possible application was not recognized.

It is a good idea to publicize needs very widely and in unusual places, before wasting too much time and money on initiating fresh research. For example, The Expanded Programme for Immunization looked for a way to pick out any vaccines that are no longer potent because, somewhere along the 'cold chain' line, they have been exposed to too high a temperature for too long. A certain chemical company already had a polymer which changed colour with time and temperature, but had no idea how to make any use of this. Thanks to Dr Patrick Tam at the Programme for Appropriate Technology in Health in Seattle[8], the polymer has now become the basis for an in expensive vaccine marker which clearly shows when measles vaccine should no longer be used. This advance will save money and lives; more importantly, it will promote confidence in the effectiveness of measles vaccine and so save more and more lives. A sophisticated epoxy resin is now being very imaginatively used at community level to make aids for living for the disabled.

Most of all, though, it is important for the knowledge we already possess to be more widely shared. As Dr Maurice King wrote in the preface to an annotated bibliography about health care auxiliaries which we in London put together :

> "In our age the greatest challenge before world medicine is to see that the most useful parts of the knowledge we already have are brought to all those who need it"[9].

Appropriate technology is indeed a great deal more than gadgets and devices. It is both software and hardware in appropriate combinations.

We appreciate more and more the multi-dimensional nature of health, concerned as health is with every aspect of life. I would like to remind you of Florence Nightingale's words, because she gave much thought more than a century ago to this country of India and its health problems :

> "Health is not only to be well, but to be able to use well every power we have to use."

An important contribution appropriate technology must make to primary health care is to develop what Professor Ramalingaswami calls 'social carriers' for health improvement. We have to find entry points to open up communities to changes that bring health benefits along with them, although the connections may not be immediately obvious. This calls for greater intersectoral cooperation at all levels. People mostly seem to value education more highly than health care because they see it as a more obvious way to earning more money and so having a better standard of living. Providing part-time schooling for children in rural villages, as the Indian Institute of Education is pioneering in Pune District in Maharashtra State[10], is appropriate health technology. School children can help greatly as social carriers and the idea of enlisting them in the campaign against xerophthalmia—blinding malnutrition—is an excellent one. That is one problem that can be dealt with here and now if we can only get the message and the means to the people. And the same applies to oral rehydration as a way of cutting the unnecessary death rate among babies and small children from diarrhoeal disease. I would like to remind you about Dr Jon Rohde's work in Indonesia using schoolchildren to convey basic health messages including that of rehydration.

Communication is, therefore, an obvious area where appropriate technology can make valuable contributions both in content and in form. Health education, to be effective, must be based on an accurate assessment of a particular community's needs; it needs to be provided in a way that is acceptable to and practical for that community; and it needs ongoing, practical support. People must not only know but also do, and if innovations are being introduced, then the resources must be available. It is pointless to arouse interest if the means to do something different are unobtainable. Appropriate technology must, therefore, also concern itself with management and logistics systems.

Evaluation is likewise critical to the success of any innovation and we need appropriate technologies to evaluate intervention programmes at local level and to feed back the information to communities in some kind of micro-loop health information systems. I saw this done 3 years ago in a very isolated part of Iran by a village health worker who was himself only just literate. The first summer he worked in his village after his training, he worried about the severe diarrhoea which killed a lot of the children in spite of his efforts with oral rehydration. So he drew a simple map and pointed out how the houses where children died were near the lower end of the stream which served the villages as water supply and for all other purposes. He persuaded the

people to draw their drinking water from a covered spring outside and upstream from the village, and the next year no child died. Everyone understood the map and he was planning how to bring the water from the spring by pipe to the centre of the village with the community's help. Rural people may not always be able to read, but they can usually count and they understand the right kind of pictures. Two days ago I saw a very similar map of people and houses drawn by one of the children at a Mobile Creche in Delhi. Techniques for simple epidemiology and evaluation at village level are crucial to the success of primary health care programmes. The Integrated Child Development Programme in Orissa and other States has developed forms which can quite easily be used by village health workers to monitor the health and nutritional status of the children.

But appropriate technology is becoming a fashionable catchword, and this could be dangerous. Too much is being too rapidly expected of it. It is not necessarily simple and we must never become romantic about it. Jequier[11] has set out some criteria for appropriateness which are, I think, still valid. To be appropriate for the circumstances in which it will be used, a technology must be :

1. scientifically effective (it works)
2. culturally acceptable (it fits into the hands and minds of the people and does not endanger a social fabric that may already be fragile)
3. economically feasible (they can afford it within the resources available)
4. have an evolutionary capacity (it can be extended and built upon and is likely to lead to other changes)
5. should be environmentally harmless, or, at least, minimally harmful.

If we take the development of a biogas system in a small community, we can see how well it fits with all of these criteria; and people used to building with weeds and mud quickly adapt to reinforced cement as construction material.

Jequier has also described the need we now face in the appropriate technology movement to make the transition from the small scale experiments and the pilot innovations of today to the massive application of the useful devices (hardware) and the most effective forms of organization (software). The need for appropriate technology has been recognized at all levels; by national planning institutions, government ministries, established research centres, development agencies, financial institutions and industrial corporations. The heat is on and there is an urgent need for good intelligence policies, a review of decision-making mechanisms and a better linkage between appropriate technology and overall development strategies. Too much may be expected of appropriate technology and I suggest that the biggest problem we face is how to develop the social technology, the organizational and administrative methodology that permits the putting together of the patchwork of small projects to form a practical, functional whole. Replicating successful small projects on the massive scale that is needed requires complex and skilful planning if community participation is to be maintained and not stifled by regimentation from above.

We may be able to usefully learn from the way in which large industrial corporations have developed communication

channels, their technology transfer mechanisms, their internal management training facilities and their creative uses of financial control. To meet the goal of Health for All by the Year 2000, we have to enlist all the help we can get, and I sense an increasing willingness on the part of commercial institutions to become involved. It is our responsibility as health professionals to show them how they can become a force for good rather than a destructive force.

This brings me back to the role of appropriate technology groups as two-way information channels, as key points in a global information network. They must support community projects and they must test and evaluate software as well as hardware. Are all experiments in primary health care, for instance, as successful as they appear? The World Bank needs to know how to invest better at the outermost periphery; the community needs to know how to get any outside help it needs and in a form it can accept and use most effectively. Health professionals have a major part to play both in direct support of primary health care and in supporting and suggesting a wide variety of health-related technological innovations. Dr Norman Bethune wrote :

> "that the function of medicine is greater than the maintenance of the doctor's position, that the security of the people's health is our primary duty, that we are above professional privileges[13]".

Finally, I would like to thank you all for listening to me and to end where I began with the only resource on which we can rely, the people and what I think must be our relationship with them.

> "Go to the people
> Live among the people
> Learn from the people
> Plan with the people
> Work with the people
> Start with what the people know
> Build on what the people have
> Teach by showing; learn by doing
> Not a showcase but a pattern
> Not odds and ends but a system
> Not piecemeal but integrated approach
> Not to conform but to transform
> Not relief but release".

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Nature and magnitude of the problems of the handicapped

S.K. Varma

Department of Rehabilitation and Artificial Limbs, All India Institute of Medical Sciences, New Delhi

India is, after China, the second largest developing country in the world with a population of over six hundred million people. A little over eighty per cent of the population lives in villages, where reliable statistics are difficult to come by. The magnitude of the problem of disability in India is inaccurate and limited. Few research studies have been undertaken in this area and these lack comparability because different definitions and criteria of disability have been used. Most of the quantitative studies deal with estimations of the prevalence of impairment and functional limitations rather than the disability. Some of the figures are over estimations and others grossly understate the magnitude of the problems.

The World Health Organisation estimated that 10 per cent of the world population is disabled. Allowing for some errors, the lowest estimates exceed 8 per cent of the world population. If we apply the same percentage to calculate the number of disabled in India, then the disabled number from 48 to 60 million. These include the orthopaedically handicapped, the deaf and mute, the blind and visually handicapped, mentally retarded and mentally ill. We have to contend with ever increasing numbers due to the following factors :

1. Increase in population
2. Decrease in mortality and increase in morbidity
3 Increase in industrial, agricultural and road accidents
4. Use of forceps during delivery and late child bearing
5. Increased survival rate of premature infants due to better neonatal care
6. Increased use of irradiation, X rays *etc.*
7. Nutritional deficiency
8. Increased incidence of cerebrovascular and collagen diseases
9. Increased incidence of congenital diseases

It is estimated that the population increases by about 13 million a year and 1·3 million disabled people are added every year too.

Advances in medicine and surgery have enhanced the survival rate of certain handicapped people who would have died early otherwise. For example, the

use of antibiotics in those prone to infections like mongols and those with CNS infections have saved them. Modern surgical techniques in the management of hydrocephalus, meningomyelocele as well as greater obstetrical interference have saved many babies but left them with physical disability, mental handicaps, epilepsy and various other defects. Better neonatal care has led to increased survival rate of pre-mature infants who have higher incidence of brain damage and congenital defects.

Due to inadequate preventive measures, reduction in the number of persons who suffer from diseases which leave them with disability, such as polio, tuberculosis, trachoma, malaria and leprosy—has not been achieved. The mortality from gastro-intestinal and respiratory diseases has been reduced. This also implies that along with the young paralysed, blind and deaf persons, those with severe complicated fractures, severe burns, blindness or mental disturbances (*e.g.* psychosis, retardation *etc.*) will survive and occupy an increasing part of the adult and aged population.

Increase in industrial, agricultural and road accidents have led to an increase in the number of disabled in the country. Increased urbanization with rapid industrialisation is also associated with a rise in the incidence of neurosis, psychosomatic disorders, alcoholism and drug abuse.

Advanced maternal age is responsible for the birth of mongols. Food shortages lead to malnutrition and anaemia in mothers, resulting in increased incidence of pre-term births, early rickets and mental retardation in babies.

Narcotics, greater use of anaesthetics, sedatives and other drugs have led to an increase in the incidence of congenital amputees.

Till such time that we are able to moderate many of the above factors by early and timely care, the problem of the handicapped is bound to increase.

In our country there is a close association between disability and socio-economic levels; poverty, lack of education and job opportunities, working conditions, geographical isolation, social prejudices, religious factors may be correlated with disability. The highest incidence of disability is found among the underprivileged. No single intervention (such as improved medical services) would solve this complex, multifaceted problem of the disabled. Most of the facilities for the disabled are located in urban areas and there are none in the eastern region of India.

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Aids for the handicapped

A.K. Mukherjee and M.G. Mokashi

All India Institute of Physical Medicine and Rehabilitation, Bombay

India is the second largest country in the world in terms of her population and there are approximately 60 million disabled. About 0·7—0·9 million disabled people are added every year to the existing number. Of these disabled, 80% live in rural areas where health care programme is inadequate. There are only about thirty centres in our country for the disabled, most of which are in urban areas.

Till now, various aids for the physically handicapped have been developed from Western models, designs and materials. There is hardly any reported work which has identified the needs of the rural disabled or modified aids to suit the Indian way of life. As the social customs and culture is different in India in comparison to the West, it is vital that a retrospective analysis of the existing system be carried out before formulating the strategies for health care programmes.

At the All India Institute of Physical Medicine and Rehabilitation, Bombay, an attempt is continuously being made to understand the needs of the Indian disabled especially the rural population and to identify the materials and designs which are compatible with the Indian disabled.

Aids

It is important to identify the materials and designs which are suitable to the Indians. India is one of the 10 most industrialised countries in the world with one of the largest pools of scientific and technical manpower. The ideal would be development of aids combining scientific knowledge and rural technology.

Awareness of the total problem of the handicapped is lacking. Unless an attempt is made to educate the public no special aids will really help the disabled. A vigorous attempt should be made, using all available communication media, to achieve social integration of the disabled with the community.

To gain physical independence it is necessary to have the various aids supporting or substituting any function of the body. The aids can be classified as follows :—

(*a*) Orthosis
(*b*) Prosthesis
(*c*) Ambulatory aids
(*d*) Miscellaneous.

Orthosis : In conventional orthosis both the design and material are not fully compatible with the Indian way of life,

for example a patient has to put on shoes for using lower limb callipers thereby restricting his participation in religious and other social customs. Secondly, orthotic joints do not allow the squatting posture and are heavy, cosmetically unacceptable, with more wear and tear in hot humid tropical weather. Keeping this, in mind various plastic materials have been introduced in place of the metallic components and new designs developed to overcome the problems. A study of over 200 patients fitted with plastic orthosis shows the success of shoeless orthosis, interrupted bracing, SACH orthosis, the AIIPMR knee-cage and detachable folding orthosis.

Prosthesis : One of the major drawbacks in the existing prosthesis of the lower limb is the lack of proper dorsiflexion in the ankle and full flexion in the knee joint. Fabrication itself is complex, where skilled trained technicians and basic workshop facilities are essential. Moreover, suitable materials are yet to be identified for fabrication. To reach such a vast population of rural disabled it is necessary to introduce a concept of the modular system, whereby prefabricated parts can be assembled with minimal manpower and workshop facilities. The work done by ALIMCO can certainly be identified as a positive forward step in the development of prosthetic and orthotic field.

In AIIPMR, an experimental model for the above-knee prosthesis which can allow cross-legged sitting and squatting postures is under trial.

Ambulatory aids : For effective ambulation of disabled an attempt has been made to introduce : (*1*) a wooden-wheel chair (*2*) a wooden board with castor wheels, with or without back-rest (*3*) a hand-driven tricycle which can be driven through uneven narrow and rough roads.

Miscellaneous : It is not always necessary to provide prosthesis or orthosis to achieve basic functional independence. To overcome the minimum disability self help devices such as chappatti-rollers, glass holders, universal holders *etc.* which are simple, cheap and easily fabricable can provide valuable solutions.

Materials such as urinary bags, iliostomy bags and others also have a place in the management of the disabled.

Often, the health professionals are under the misconception that rehabilitation is costly and should not be considered on a priority basis. Cost-benefit analysis shows that prevention of poliomyelitis with polio vaccine costs Rs. 0·5 per individual whereas maintenance of a polio patients cost minimum of Rs. 125/- per year. The existing health-care machinery of the government needs further support for implementing the programme for total care of Indian disabled. The participation of the community as well as voluntary agencies can play a vital role in looking after this section of society. The existing health care structure can provide a base for building up the rehabilitation programme. To reach the rural disabled, it is necessary to hold camps through medical colleges and other rehabilitation centres and to run mobile rehabilitation services. These mobile units will provide rehabilitation services such as fitting of pylons and prefabricated orthosis. Preventive

programmes like anti-polio campaigns, and educational programmes will also be included. The community health worker may be involved for rehabilitation. A comprehensive multipurpose rehabilitation therapist may be utilized. A training programme for such personnel exists at AIIPMR since the last 5 years.

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Appropriate technology in rehabilitation aids

P.K. Sethi

Rehabilitation Research and Regional Limb Fitting Centre,
Sawai Man Singh Medical College, Jaipur

About 20 years ago, we at Jaipur, decided to set up a workshop for production of appliances for the handicapped. Our objective was primarily to cater to the needs of the neediest *i.e.* the rural and the poorer section of our society. The affluent, we felt, could continue to go to Poona or Bombay and procure an artificial limb or a caliper at a cost which often exceeded the annual per capita income of a rural poor.

Our aims were two-fold. The appliances should be as inexpensive as possible and a patient should not be required to travel long distances to be able to get them.

Very soon, however, we started running into a contradiction. As is customary with us, we like to follow the trends in the West and the designs of our appliances were no exception. These were all conceived and developed in the west. We found, to our surprise, that most of our polio patients were not really using the calipers and many of our amputees were reverting back to crutches. This disturbed us and so we started closely questioning our patients to understand the reasons for rejection of these appliances. It was then not difficult to identify some very obvious features in the design of these appliances which made them quite unsuitable for the average Indian life style. For example, the foot-piece of a western artificial limb has to be hidden and protected by a shoe. Without a shoe, the limb cannot be used. Shoes are normally not worn by most Indians. If we want our artificial limbs to be used at home, by our women, by farmers working in their fields, in places of worship, we had to do away with the shoe. This meant that the footpiece should be suitable for barefoot walking. The moment the outer facade provided by the shoe is peeled away, it becomes essential that the footpiece should cosmetically simulate a natural foot. Also, its delicate material needs to be replaced by a waterproof, durable exterior which can withstand walking on the rugged terrain of our rural landscape. Not only this, most of our countrymen squat and sit cross-legged on floor. Squatting requires full dorsiflexion at the ankle. During cross-legged sitting, the outer border of the foot is pressed inwards, twisting the foot into inversion and internal rotation. Wearing a Western limb, an amputee cannot work sitting in a cross-legged position because the twist on the foot-piece is transmitted to the stump causing unbearable pain. Additional freedom of movements are therefore necessary in a footpiece to allow our amputees to

pursue a normal life style. The footpiece should also possess a degree of suppleness which allows it to adapt to the uneven surfaces on which a villager is required to walk. The Western, chair-sitting amputee never needed these movements and their footpiece, understandably, does not possess these attributes. Similarly, various problems were encountered when scrutinizing the designs of calipers for polio patients.

We therefore formulated a different set of design criteria and tried to work out appropriate theoretical constructs. We approached our formally trained prosthetists to prepare some experimental footpieces incorporating these ideas, but it was evident that their education had never prepared them to think of alternatives and they did not possess the necessary skills or the aptitude required for this work. All they can do, to borrow a phrase from Professor Amulya Reddy, is to reproduce 'blurred xerox copies of Western appliances'.

It was at this stage that the author approached our traditional craftsmen. He had seen their skills and felt that possibly they could help us. They understood the problem and prepared a die, using the traditional sand-casting method. We were thus able to produce, develop and refine a completely different design of a footpiece which looks like a foot. Its interior contains a design, which enables squatting, sitting cross-legged on floor, farming, irrigating fields, working in wet fields, and walking barefoot on uneven ground. Heavy work such as pulling a rickshaw becomes easy. So good is the adaptability that even scaling a vertical rock-face or climbing trees is no problem. You would agree that a design which permits these activities can be considered as an appropriate design. The element of rehabilitation is 'built in' in the design of the limb *i.e.* a farmer can go back to his village and pursue his original vocation and not migrate to a town to look out for a sedentary occupation.

These traditional craftsmen, learning at their masters' feet, have fantastic skills and a love for working with their hands. And contrary to popular belief they have amazing ingenuity. With simple tools, they are able to produce decorative objects which fill our handicraft emporia. A statue of a village amputee was made without any casting, from handbeaten aluminium sheets by one of our artisans and is almost a piece of art. For persons who can shape metal with such skill, making an aluminium artificial limb is a child's play. So why use expensive polyesters which are now fashionable in modern limbs ? We switched on to making metal limbs, which our artisans can made with such speed and dexterity that orthopaedic surgeons from abroad are taken aback when they find a trial limb being fitted in 45 minutes from the time of taking the measurements. It is this simplification which has led to an incredible rise in our work out-put from 60 limbs in 1975, the output is 1500 limbs in 1980. Also, the cost of such appliances is a fraction of orthodox western limbs. A below knee prosthesis costs merely as much as a pair of fancy shoes.

Once this breakthrough was achieved in the case of the prosthetic footpiece, we felt intellectually liberated to examine critically all the designs we have copied from the West. A series of new designs have been developed. As a result of work

ing with our local artisans, I have a tremendous respect for their native skills and self reliance. One often encounters amazing examples of ingenuity of design in peg legs which many of our amputees walk on, and which the village carpenter conceived without any training in prosthetics. A most ingenious, airy, cool and adjustable socket, using strips of bamboo, was designed. Our hot climate makes it a much more acceptable design than the biomechanically superior but unbearably hot modern total contact socket. The concept is beautiful. It is now up to us to refine such attempts. If we adopt a general policy of exhorting these artisans and learn how to communicate our requirements to them, they are perfectly capable of rising to the occasion and produce results with their traditional technology which is appropriate in every sense of the term. Showing an engineering drawing to them is futile. But show them a 3-dimensional model and they can replicate it in no time.

The author has also become increasingly sceptical about the relevance of the formal education we are imparting to our prosthetists and orthotists. Reared in large metropolitan towns, accustomed to good living, and even though capable of talking in English with a lot of technical jargon, they lack skills, dislike soiling their hands with manual work and acquire a value-system wherein they are often scornful towards our patients and mercenary in their outlook. In short, they become whitecollar workers who would never willingly go to work in rural India.

To be able to study the performances of the two groups *i.e.* the formally educated professionals versus the local artisans, we have, at Jaipur, developed two models of workshops in our own department. One employs the formally educated diploma holders in Rehabilitation Engineering, using high-cost Western technology and the other is run by illiterate but highly skilled local artisans using a low-cost appropriate technology. We are convinced that, utilizing appropriate technology, the output of work is more than double with less than half the investments; the quality of products is superior and their patients are much more satisfied. While I would not like to raise something like the C.P. Snow-Leavis controversy, I think we have here another example of 'Two cultures'. The author would opt for the more convivial culture provided by our traditional craftsmen rather than an alienated group who are becoming increasingly divorced from the mainstream of our rural population.

Following the generation of appropriate technology at the microlevel in one institution, it then becomes essential to consider the problem of technology diffusion at a national macro-level to make the experiment socially meaningful. We have been working at this problem and find that several difficulties pave the way :

1. Our own professional colleagues (in this case the orthopaedic surgeons) view with suspicion anything which appears to them to be unorthodox. Unless a technology is imported from the West and is expensive, it does not acquire respectability. That is why, even though field trials in over 5000 amputees and strict laboratory controls convinced us of the superiority of our limb, we had to wait till Western surgeons put their stamp of approval on our work before the local

resistance could be overcome to some extent.

2. Each profession zealously guards its own interests and creates a mystique so that its knowledge remains exclusive. A process of demystification is frowned upon and I have been accused of introducing quackery by associating local artisans with, what is considered to be an exclusive professional domain.

3. The author agrees entirely with Ivan Illich that we are confusing schooling with education. These are different attributes. One find the illiterate artisan limb maker analysing a limp in an amputee using the same kind of logic as the author would employ in clinical work and often his analysis is found superior to the authors own. When a car is taken the illiterate garage mechanic, he is again using the same kind of logic for fault finding. How can we call him uneducated ? We have to rid ourselves of such conceptual mental blocks.

4. In the bureaucratic framework of a Government hospital the artisan can never get justice in the matter of his salary structure. The author has repeatedly seen a skilled craftsman, who was earning over Rs. 1000/- a month in the market, being offered by the hospital the meagre salary of a helper just because he is a non-matriculate. In a national programme, if we have to get our large reservoir of artisans to participate, new criteria for skill measurement shall have to be found out. At Jaipur we could never draw these artisans in our work without outside assistance This we got from the local community and we worked out an interesting but very viable model of a joint participation oft he surgeon, the artisan and a voluntary organization, which not only makes up for the deficiencies of their salary structures but gives us more elbow room for innovations.

If our profession sheds its prejudices and decides to accept appropriate technology, if we can utilize the enormous reservoir of native talent which is available in every town and village and if we can arrange to pay these artisans on a non-exploitative basis, it then becomes within the realm of possibility to provide rehabilitation aids to the neediest anywhere in the country. Every village in our country has a cobbler, a carpenter and a blacksmith. If this group can make agricultural tools, bullock carts or saddles for horses, why can't they make appliances for the handicapped ? What has a caliper for a polio patient in its design which is beyond the competence of a village artisan ? Of course, as Professor Amulya Reddy emphasizes, appropriate technology does not mean turning one's back on progress. The latest scientific knowledge should go into the development of new innovations. Appropriate technology is not necessarily primitive technology though there is nothing wrong in using traditional tools and materials and utilizing them for a superior bio-mechanical design. But there is no justification for continuing to lean on the West for ideas, import expensive technology and allow only a handful of formally trained professionals to work in this field.

Using this strategy, one can visualize the emergence of a network of larger workshops at major hospitals employing creative craftsmen where the more complex appliances cannot only be made but new appliances developed; medium sized workshops at District

Hospital level where standard simple appliances can be made available at a modest price, and a one-man workshop at a Primary Health Centre level where a locally identified artisan can be provided with models of simple appliances such as splints for disability prevention. He could also perform repair jobs on artificial limbs and calipers. This work could be in addition to his original vocation, enabling him to augment his income. ICMR should seriously consider the idea of helping in the preparation of simple Instruction Manuals and models which could be utilized both by professional medical personel as well as our local artisans for diffusion of this technology and support research schemes which help the development of the whole range rehabilitation aids which suit our people.

Such a strategy would lead to the satisfaction of basic human needs, generate self-reliance, demystify medical knowledge, encourage social participation and advance developmental objectives. These, afterall, are the objectives of appropriate technology.

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Domiciliary treatment in primary health care

Mabelle Arole

Comprehensive Rural Health Project
Jamkhed, Ahmednagar

Most illnesses begin as simple problems. In the absence of trained personnel to intervene at the onset of illness, the illness results in serious episodes. The community is capable of learning simple facts and acquiring elementary skills to manage simple illnesses. Family members are the closest to the sick person, therefore family is the front-line health worker. In addition to the family, local members of the community both individually and collectively can be trained to become front line workers. Some areas in primary health care are identified where the local agents singly or together with health professionals can deliver domiciliary curative care to the communities.

Community Health Volunteers are being increasingly involved in primary health care. The positive aspect of this arrangement is that the CHV knows the community, is available to the people at all times, shares their life style, is accountable and acceptable to the people.

Basically the CHV is primarily responsible to impart health education which results in removal of harmful traditions and changes communities' behaviour to positive health, and provides technical inputs for prevention of illness and promotion of health. It is assumed that the CHV has a good foundation of health education and on this foundation she bases her curative activities. The classic example of domiciliary treatment is treatment of diarrhoea in children. The Community Health Volunteer prepares rehydration solution using water, salt, sugar and lemon juice. The solution is given at regular intervals till the child stops vomiting and diarrhoea and is ready to take other oral feeds. This treatment is also used for adults. The technique of oral rehydration is easily taught to members of community organisations such as youth clubs and *Mahila mandals*.

Acute conjuctivities often affects rural children. Its spread is often related to breeding of flies just before monsoon. The primary health worker washes the eyes with saline regularly an applies antibiotic eye ointment. Similarly mothers are taught to treat their children at home. Scabies and other skin infections are common in the villages. The CHV washes the lesion with water and applies anti-scabies ointment regularly. Application of neem seed paste and neem leaves helps cure scabies. Papaya dressing is used for chronic skin ulcers. Local heat application for abscesses, sprains *etc.* are also carried out. Mothers are encouraged to give food and plenty of water to children with fever. High fevers are managed with cold sponging. Aspirin is given by the community health worker.

A safe delivery under sterile conditions can be conducted by a trained primary health worker. The delivery kit consists of soap, sterile pieces of cloth or paper, a cordtie and dressings, blade and antiseptic lotion. Previously determined critera help in selecting proper mother for home delivery by the local worker. After conducting safe delivery she dispenses analgesics and ergot to the mother. She does cord dressing and takes care of the eyes of the new born.

Incidence of chronic illnesses such as tuberculosis, leprosy, malaria, filariasis and work infestations is universally high. The primary health workers are best suited to give routine treatment over a long period of time to patients. Most of these patients come from a poor socio-economic group and/or these illnesses drive a person into poverty. They cannot be away from their village for treatment at the city centres neither do they have money to pay exhorbitant fees to private healers. In addition to routine treatment, the monitoring of these illnesses in general is simple-such as monitoring weight gain of a tuberculosis patient. Similarly diseases caused by vitamin deficiency, and clinical malnutrition due to protein-calorie defeciencies can be treated in the village by local volunteers. Symptomatic treatment for flu, headache, fevers abdominal pain *etc.* are also carried out by the CHV.

The role of the multipurpose worker in curative care is that of referral. Regular visits by the MPW on a weekly basis are ideal. The MPW will assist in making a diagnosis, and make decision to alter or continue curative care. The CHV is essentially giving symptomatic treatment for a limited period of time (*i.e.* 2-3 days or even less in children). The MPW will help make a diagnosis and she will also use skills which the CHV does not have. MPW with the help of standing orders provided by the physician, will give treatment in the village.

In case of emergencies the CHV may bypass the MPW and approach the physician directly. Generally these will be emergencies for severe trauma, extensive burns, poisoning, snake bite, severe haemorrhages and acute abdomen, and those diseases needing investigations. There are a number of conditions where diagnosis will be made by the physician and domiciliary treatment carried out in the village by the CHV or MPW. These may include treatment of tuberculosis, leprosy, malaria, filariasis, and other chronic illnesses such as diabetes, chronic arthritis, peptic ulcer, hypertension and the like.

Discussion on domiciliary curative treatment will not be complete without reference to simple diagnostic laboratory tests suitable in the field and collection of specimens for this purpose. Some of these tests would be haemoglobin, simple urine analysis, blood and skin smears for malaria, filaria leprosy, sputum smears for tuberculosis and stool examination for parasites.

The Community Health Volunteers and drugs

The training of CHVs must emphasize the marginal role that drugs play in treatment of given illness. She must be conversant with simple practical common sense procedures for treatment of illnesses. Use of simple local herbs and other materials which have proved useful should be taught. She must not unnecessarily

stock up drugs in her kit. Simple list of basic drugs which comes to less than 20 should be enough (Table).

Table. Drugs in CHV kit

1.	Aspirin —Adult —Children
2.	Chloroquine
3.	Sulphonamide
4.	Diodohydroxyqinoline
5.	Piperazine or mebendazole
6.	INH
7.	Theacetazone
8.	Dapsone
9.	Ferrous sulphate
10.	Vitamin A
11.	Vitamin B complex
12.	Tinc. Bellandonna
13.	Sodium bicarbonate
14.	Ergot
15.	Sulphur ointment
16.	Gentian violet
17.	Acriflavine
18.	Eye ointment
19.	Dressing bandages, soap, antiseptic lotion

Use of patent medicines at this level is not justified. The confidence and acceptance of the CHV will be greatly enhanced if MPWs and physicians will use the same drugs for common conditions as the CHV.

Should CHV team give injections ? Treatment of tuberculosis is an area where coverage of the patients will increase if CHV learns to give injections. Besides this and few instances of acute emergencies, injection treatment is not called for. Disadvantages associated with the use of injections by these workers outweigh the few benefits.

Except for few clear cut illnesses, treatment by CHV is symptomatic, therefore back-up services to arrive at a diagnosis after a short trial is necessary. We must understand however large number of people and children who need and benefit from simple symptomatic treatment. Even our large hospitals and city clinics are crowded with patients needing this kind of care. Contribution by the CHV solve these problems which consume time and energies of professionals must be viewed positively and appreciated by health professionals.

Community Health Volunteers and multipurpose health workers can effecvely manage 80-90 per cent of illnesses using simple treatment sat the village level. Constant supply of drugs, close supervision and good referral system will ensure good curative services at the community level.

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Management of emergencies in primary health care

Mabelle Arole

Comprehensive Rural Health Project
Jamkhed, Ahmednagar

Generally credibility of a health worker depends upon his ability to cope with medical emergency situations. In the absence of a physician in each village or hamlet the Community Health Worker has the responsibility of managing emergencies. There are many obstacles in the treatment of patients taking suddenly ill. Ordinarily villagers seek help of neighbours and local healers.

The types of emergencies differ in rural areas and common emergencies are described

1. *Accidents* :

   Fall from trees, bullock cart and other accidents, *e.g.* bull gores, injuries with farm implements, injuries from falling debris *i.e.* house collapse, wells *etc.*
   Bites—Snake and insect bites.
   Burns—drowning *etc.*
   Poisoning—swallowing different seeds, pesticides *etc.*

2. All obstetric emergencies—specially bleeding, eclampsia and obstructed labour and ruptured uterus.

3. Emergencies—related to children, convulsions, dehydration, and acute respiratory distress.

4. Other problems such as acute abdomen, shock, haemoptysis, asthma, cardiac failure *etc.*

5. Exposure to extreme heat and cold.

Generally crucial hours are spent in reaching the medical facility. In the absence of telephone, a messenger has to take the message on foot or by bicycle. Precious time can be saved by establishing telecommunications either through a telephone or a two-way radio.

Establishment of good communication service will allow the physician to instruct the community health workers in giving first aid to the patients. It will also help the health centre to get ready for the arrival of the patient.

Management of emergencies : Essential part of training of CHV must be in instructing them in how to cope with emergencies. In addition to the CHV, members of the community such as youth clubs and *mahaila mandals* should also know first aid. Health education to deal with taboos and wrong traditions *e.g.* snake bite, delivery, is essential. Fortunately, life-threatening emergencies in a given village are few. There may not be more than four or five such cases in a year in a village. Majority of trauma

cases occur during day time where there is sufficient light and people are available.

The health worker can control the bleeding by using tourniquet and pressure bandages. She can wash the wound and apply relatively clean dressing before further treatment is given at a distant medical facility. Splinting of fractures using bamboo or other local material is done by the primary health worker. Snake bites are managed by immediate application of tourniquet and sucking out the poison from the site. Victims of drowning are given artificial respiration by various techniques and removal of fluid from the lungs can be done by the local health worker. Most of the convulsions in children are due to fever and the local health worker can use simple techniques to reduce the fever by bathing him in cold water, by administration of aspirin and by oral fluids when child is conscious. Similarly the victims of heat stroke can be cooled at the site before transporting to health centre. The CHV can administer simple inhalation to a child with respiratory distress.

Poisoning among children often occurs due to ingestion of wild seeds or fruit and accidental ingestion of pesticides or kerosene. The health worker can induce vomiting by administering salt water or by other physical methods such as introducing fingers in the throat.

There are some emergencies where little can be done locally and need immediate transportation. The commonest mode of transport is a bullock-cart. Some villages may be able to use bicycle carrier to transport children. Local tractors, jeeps and trucks help in prompt transport of the patient, if available. Transportation of sick patients is done on animal driven vehicles (bullock-cart tonga and animal back) sometimes the only means available are human hands and human back. Considering the terrain and cost of energy fuels the present mode of transport may not change drastically in the next twenty years. Appropriate modifications should be done to make the transport of such patients safe and comfortable. In fact, a bullock cart ride is used to expedite delivery. Use of simple pneumatic tyres, proper padding of bullock-cart with straw and soft material and mechanical changes to reduce friction can make bullock-cart ride safe and relatively confortable. Similarly bicycles can have an attachment which will allow patient to lie comfortably for a short distance. Introduction of boats to cross rivers and lakes specially where such transport is not widely used, is necessary.

Management in transit : Person accompanying the patient must be skilled in applying various physical manouvres such as mouth to mouth breathing prevention of injury during convulsions, prevention of aspiration of fluids *etc.*

A first-aid kit needs to be devised using a appropriate materials easily available locally—some examples would be bamboo or wooden sticks with strings for temporary splinting, a simple kit for first-aid in snake bite consisting of string, sterile blade and simple suction device ordinarily used by local healers, soap and dressing material, antiseptics *etc.* A torch or lantern should be available. The multi-purpose workers should have skills in introducing nasogastric tube, administration of iv fluids, catheterisation *etc.* The

MPWs should have emrgency kit consisting of pain killers, respiratory stimulants, anti-histamines, iv fluids anti-snake venom, atropine *etc*. The list of drugs *etc*. will vary and depend upon the emergencies that arise in the area.

Excepting few situations such as poisoning and snake bite, which need specific drugs, generally the competence in handling the situation will determine the outcome of emergency. The CHVs and MPWs need appropriate skills in handling the situation. By and large the individual skill seems to be more important than certain rituals such has indiscriminate use of oxygen.

Appropriate Technology for Primary Health Care, 1981 pp 43-47

Support services for primary health care

L.M. Nath and S.K. Kapoor

Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi

The concept of primary health care, specially as we see it in our country, and in the light of the Alma Ata declaration, clearly envisages a team approach with graded skills and responsibilities right from the grass-roots or primary care functionaries to the specialists at the tertiary care level. Needless to say—no category, no level, no individual member of the health care team is independant of the rest of the team.

The lowest level functionaries, the primary health care workers are perhaps specially dependent upon adequate support from other members of the team. Support in terms of drugs and supplies, in terms of technical guidance and supervision, in terms of diagnostic and referral services. No one can seriously advocate a primary health care worker functioning in isolation and managing all the morbidity in the community, nor even managing all the preventive, promotive or rehabilitative requirements of the community he serves. The simplest support requirement that we can visualise is in terms of ensuring an adequate and timely supply of all materials required in his day to day work—from drugs, immunising agents, surgical supplies, to items such as stationary, audio-visual and publicity material. A shortage or a delay in the supply of material has an effect far beyond the mere absence of a required item for a few days—it can be a devastating blow to the morale of a worker who may feel neglected and isolated and develop a *laissez-faire* attitude to his work.

Support facilities are required by the primary health care worker to enable him to do his job efficiently, to maintain his credibility with the people he serves, and to effectively meet the health care needs of the community. The efficacy of the primary health care worker as a giver of medical care is well established. In a study where we analysed the curative work of trained paramedical workers, the history, diagnosis and treatment matched in over 70% of the cases seen. Similarly in a study of the post-mortum diagnosis of cause of death the diagnosis of the paramedical coincided with that of a doctor in 80% of the cases after their manual was modified and corrected. Not only are workers trained to give curative medicine rendering a useful service, but perhaps equally or more important he/she is much more acceptable to the community in his role as a provider of health education, public health work, preventive services *etc.* Any meaningful discussion of the requirements of the primary health care worker must be built around the work that he is

expected to do, the service the community expects from him. An analysis of domiciliary cases is given in Table I.

It will be self-evident that in the context of the primary health care worker, correct management of the case includes making one of three major decisions—and this applies to all cases he sees.

1. Patient does not need any medication/advice.

2. Patient needs medication/advice and can be managed by the worker himself or herself.

3. Patient must see doctor immediately/soon.

The support service needed therefore are for the second and third category and it is worthwhile stressing that the credibility of the primary health care worker depends not only on his own ability but upon the promptitude and efficacy of the aid given to patients referred by him.

Table I. Domiciliary morbidity analysis 1980

Diagnosis	Number	Percentage
Fever unspecified	6036	26·0
Respiratory diseases	4018	17·3
Diarrhoeal diseases	3176	13·7
Aches ill defined	2097	9·0
Malaria	1421	6·1
Abscess/pyoderma boils	1282	5·5
Conjunctivitis/trachoma	1228	5·3
Scabies	887	3·8
Injury	645	2·8
Caries tooth	405	1·7
Anaemia	316	1·4
CSOM	282	1·2
Remaining	1619	7·1
Total	23007	100·0

Laboratory : Patients referred to the intermediate levels of health care—be it at the primary health centre or at the intermediate or referral hospital often require investigations to facilitate their management. Keeping in mind the distribution of morbidity it will be appreciated that two aspects are immediately evident :

Laboratory facilities are essential.

Laboratory facilities need to be relatively simple.

For example, in 1980 at Ballabgarh alone the OPD patient load was 1,84,904 patient visits, 3850 admissions and 973 deliveries. For all these just over 35,000 laboratory investigations were done. Of these 35,026 investigations the vast majority, 20,588 or 60% were for malaria, leaving only 39·6% for the other OPD and indoor patients (Table II).

Similarly at Dayalpur Primary Health Centre where there is a simple laboratory with a trained laboratory assistant for a total of 30,697 patients visits, only 2,236 laboratory investigations were done. If we apply the average of 39·8% new cases (73,520 in 1,84,904) then it will be seen that an average of about 1 investigation in 6 patients is required including slides for malaria and considerably less excluding malaria (Table II).

The equipment required for the investigations is fortunately simple.

Table II. Laboratory investigations 1980

	Ballabgarh	Dayalpur	Total	%
Blood	4406	64	4470	12·0
Sputum	976	103	1079	2·9
Urine	7318	74	7392	19·8
Stool	1158	75	1233	3·3
Semen	85	—	85	0·2
CSF	65	—	65	0·2
STS	30	—	30	0·1
Slides for MP	20588	1920	22508	60·4
MX—Test	400	—	400	1·1
Total	35026	2236	37262	100·0
Per cent	94·0	6·0	100·0	

The laboratory in support of primary health care workers needs to have essentially the following :

Staff : Laboratory Technician 1
Helper 1

Equipment : Microscope 1
Sahli haemoglobinometer 1
Centrifuge 1
Counting chambers for counts and pipettes, syringes, glassware, and stains 1

In addition, the scope of the laboratory can be usefully extended by the addition of a photocolorimeter. This equipment will be adequate to do all the investigations likely to be required.

ECG : At a referral hospital, a simple electrocardiograph machine can be an asset. Though it will not be used every day, its presence will be of great benefit for the occasional patient with chest-pain whose status needs to be assessed/monitored.

X-ray : Another essential facility which is needed is a small X-ray unit. A simple 100 mA unit is quite adequate for the majority of investigations required, though my radiologist colleagues tell me that a 200 mA unit would perhaps be better.

At Ballabgarh, approximately one Skiagram is taken per 100 patient visits. The majority are for orthopaedic injuries and chest films. Of course many mons X-rays could be done—for example, ie monitoring tuberculosis patients, checking patients with respiratory system involvements and ruling out possible stones in the GB and urinary system. However, there are some patients for whom X-rays are essential and the lack of this facility will mean the referral of a patient who could be managed well at the intermediate level to the more expensive tertiary care level.

Surgery : Patients requiring surgical intervention are a category that can get almost no attention at the paramedical level. Currently no type of surgery is encouraged at this level. In the near future also we do not see this position

changing. There is no doubt that a properlyt rained paramedical worker—even at the multipurpose level—can do certain types of surgery such as incision and drainage of absesses for example—(and this lowly category takes care of 13·4% of the surgical load at the primary and intermediary care levels) but the importance of asepsis and logistic problems of maintaining adequate surgical supplies makes elective surgical intervention unwarrantable from both the cost-benefit and cost-effective angles. Of course the primary care level worker will be involved in first aid and emergency care of injuries, wounds, absesses *etc.*

Therefore, a very important support facility is the surgical operation theatre. This has to be relatively simple but must have preferably two theatres—one for clean surgery and one for infected wounds dressings, incision and drainages *etc.* The theatres can be used for general surgical work (including orthopaedics and traumatology) for eye surgery and for gynaecological work.

The theatre would need to have a good operation table, autoclave facilites, lights, fans (and/or air conditioning) an EMO inhaler and preferably a Mini Boyles machine (Cadet) with oxygen and nitrous oxide supplies and an effective autoclave unit. An electrocautery unit is an asset.

Emergency lights, a kerosene operated stand-bye autoclave unit and a foot operated suction unit are essential in view of the irregular power situation in most of the rural areas of the country.

A question that is often raised is about the necessity of a blood bank. Though by and large raising, blood donations is not a problem where sufficient goodwill has been built up, we at Ballabgarh have so far taken a stand that a blood bank is not essential and therefore not justified on economic grounds at an intermediate care facility. No doubt our decision is tempered by the proximity of Delhi and the excellence of our link with the tertiary level institutions.

There are several simple aids that can easily be made available. Some examples are as follows :

— Small pre-sterilised (by gamma radiation) plastic packets with half a razor blade, some tying thread, soap/antiseptic powder such as cetrimide, antiseptic swab and a one metre square sheet of polythene —one set could be given for each delivery.

— Shakir tapes for detecting under-five undernutrition.

— Bicycles

— A regular supply of continuing education material such as slide/cassettes or even self--instruction booklets.

In the future we must make use of imaginative and appropriate technology to improve the efficacy and quality of the services offered by the primary health care worker. We feel it is a mistake to equate the term 'appropriate technology' with 'simple technology' or 'improvised technology'. For the primary health care worker the most appropriate technology may well be a very sophisticated device. Some such devices are available—others we can only dream of until some scientist helps us out by producing the gadgets we so baddly need.

The urine of pregnant women must be routinely checked for albumin (and sugar). Very few workers trouble to carry spirit lamps (even if spirit is available by some miracle) reagents *etc.* and we have found it next to impossible to get antenatal urine examinations done in the field by female MPWs. However as soon as dip-sticks were provided the problem was solved and urine examinations are being *done*, actually done by using this device which is really a very sophisticated example of technology but very appropriate. (Incidentally the device is the most cost-effective way of dealing with the occasional blood glucose urgently required at the intermediate care level).

Similarly an electronic haematocrit working on the principle of conductivity can enable accurate quick estimates of anaemia at the sub-centre or primary health centre. Those devices are within our technological competance even today and I wish some manufacturer would take the plunge and give us electo-medical devices for use at the primary and intermediate level.

We do not even have as yet a simple portable (really portable) accurate device for weighing adults or children—yet weight measurements are a basic requirement in the field, at the sub-centre and, in fact, at all clinics.

Yet another requirement is an effective cold chain. Today the cold chain is the limitation that is preventing an effective immunisation programme at the periphery. This too is technically possible—thermo-electric devices functioning on the Peltier principle are sturdy, cheap and effective—but not available.

The paper strip for glucose is now easily available. This technology when combined with a reflectance photometer gives highly accurate readings—but such photometers are not easily available to us because of the patent on the Japanese model. These devices would be a boon to a referral hospital.

An effective simple means of communication available to the primary health care worker for consultation with the doctor and for alerting emergency teams has been shown to be a valuable tool in several countries including Alaska, Australia *etc.* In India too, in the Ballabgarh project a walkie-talkie provided to the multipurpose worker proved an extremely useful support facility—when it worked. We must develop the use of simple, reliable, robust VHF communication systems. So far we have no doubts about the utility of these VHF sets, but the quality of the sets provided by an Indian firm are far from satisfactory.

Appropriate Technology for Primary Health Care, 1981 pp 48-53

Appropriate technology and laboratory procedures*

N.P. Gupta

Indian Council of Medical Research, New Delhi

From man's earliest emergence, technology has been one of the four environments within which he has lived—the others being the cosmic, the natural, and the social.

In the 17th century, the term technology was used to mean a discussion of the applied arts only, and gradually these 'arts' themselves came to be the object of the designation. By the early 20th century, the term was coming into general usage and embraced a growing range of means, processes, and ideas in addition to tools and machines. By the second half of this century, technology was defined by such phrases as 'the means or activity by which man seeks to change or manipulate his environment.'

Appropriate technology in health can refer to a product (*e.g.* tool, equipment) a process/technique (method), or a system representing an association of techniques, methods and equipment which has been successfully introduced, adapted and utilized in a particular setting with its social, cultural, political, economic and environmental elements to help solve health problems.

Two components of appropriate technology are begining to be recognized. The first is appropriate technology 'hardware', which term refers to the products, tools or equipment, methods or processes and systems or combinations of processes and equipment. The second component is appropriate technology 'software', which refers to the organizational forms, denalytical and evaluation techniques, community approaches, *etc.* Health at the village level required both these components, the 'soft-ware', requiring muti-disciplinary expertise.

The concept of appropriate technology focuses on the need to look at the efficiency of the technology in the context of social relevance. Technologies appropriate to a national setting would most probably be a 'mix' of the various 'subsets' of technology, which planners and decision-makers of the country had to balance carefully in order that optimal socio-economic development was attained.

Appropriate technology has to be technically and scientifically sound, socially and culturally acceptable, environmentally sound, and economically viable

*This paper was submittted but not presented at the National Workshop on Appropriate Technology for Primary Health Care

within a time frame. Advances in science lead to enormous changes in relevant technologies. Economic changes accept or reject them. Technology has to be appropriate for a given period only. There is no such thing as intermediate science.

Let us look at some of the laboratory procedures in use 40 years ago in the medical field.

During 1940s the author had the privilege of both being a medical student and also a junior teacher in the Department of Pathology and Bacteriology, King George's Medical College, Lucknow. During the second world war and subsequently for several years, import of laboratory items was almost impossible. India did not produce even a small machine used in the laboratory. Almost everything had to be imported. The world war put an end to this. Laboratory work had became impossible without recourse to local resources and improvisation. The first item one would like to recall was a hand centrifuge. This was used in 1939 to pack red cells for making a haemolytic system for complement fixation tests and also to determine the PCV. Packing red cells was not easy with a hand centrifuge but it could be done. Today, electric break-downs are only too common. The hand centrifuge would provide the much needed facility for investigative work which was carried out in a clinical pathological laboratory.

In those days few in this country had heard of a microscope lamp. Most of the work in the department was done by using day light. In emergencies any electric bulb or even the lighted wick of a hurricane lantern could be used as a source of light. Later, lamps providing light for microscopy were designed from discarded milk powder tins. The tin container was inverted and a hole cut at the level of the bulb which was fitted from the closed top*. Later on a U-shaped cover of thin tin foil was provided to shield the light hitting the eye of the observer. The lamps were painted black and were in extensive use in 1950s in our Lucknow department. Much later, we received microscopes with built-in light sources. The bulbs for such lamps were specially designed and each used to cost more than Rs. 80 in those days. Having exhausted our imported stock, we got the whole fitting locally altered and were able to fit the bulb used in car head lights.

We are all used to incubators and water baths—common-place in a laboratory. Now-a-days we have incubators with heating and cooling arrangements so that they could be adjusted to any desired temperature. A small 37°C air jacketed incubator could be made with a kerosene lamp with automatic adjustment to keep the temperature constant. Such a small unit was imported. One such unit was purchased from a retired British officer, and perhaps was still functional in his laboratory (Personal communication).

We did not have electrically regulated water baths. We had to inactivate the serum at 56°C and carry out other tests at 37°C. A hurricane lantern water bath was designed by taking off the top of the hurricane and twisting the three knobs outwards. An aluminimum vessel with

*All the laboratory innovations were the handi work of Prof. S.P. Gupta, a senior member of the staff of the Department of Pathology and Bacteriology, K.G. Medical College, Lucknow, U.P.

water preheated to 37° or 56°C was placed on top of the lighted hurricane lantern. Placed in one corner of the room free of air movement, the lighted wick could be adjusted to maintain the temperature either at 37° or at 56°C. One had to observe that there was no fluctuation in the temperature for the first 10 minutes with the help of a thermometer fitted to the test tube rack. The water bath functioned smoothly for the next two hours or so without any variation in temperature. Such hurricane lantern water baths were in use by us up to 1948 when electrically operated units became available.

Anaerobic jar was always a problem. It required not only the jar; the platimun asbestos capsule did not work. We could not import one. Hydrogen could be produced from the Kipp's apparatus but every one was afraid of an explosion, when the electric current passed through the capsule. An anaerobic jar was designed with local resources. Fresh iron filling powder readily available at any ironsmith's shop at almost no cost was used. A handful of such fresh iron powder moistened with water was put in the jar. This was covered by a layer of filter paper on the top of which we placed our culture plates. The jar was evacuated after closing the lid. The glucose methylene blue indicator was attached to one of the exit tube with a rubber tube. The oxygen in the jar was used up by the iron filings. Each time the jar was opened a fresh lot of iron filings had to be put in. The indicator pointed out that the jar functioned very well and the anaerobic growth was luxuriant.

Today everyone is wanting dehydrated media in order to dissolve the granules in water, sterilise and use it. We did not have peptone during those years. It was only available for military laboratories. Peptone broth was replaced by a pancreatic digest broth. A crude extract of pig pancreas (purchased locally at Rs. 2/- per peice) was prepared and used for digesting meat granules to prepare the digest broth. The formol value of the digest broth was estimated and the necessary dilution made before sterilising it. In later years, papain was used for digesting meat at boiling temperature. This provided very cheap digest broth and it could be used liberally. Peptone broth was and continues to be highly expensive.

Agar is used for growing bacteria. Agar fibre in digest broth fielded good nutrient agar. Paper pulp and egg albumin were used to clarify the agar. Later agar fibre was also not available. Methods had to be designed to reuse the agar at which bacterial growth had earlier taken place. That was now a part of history. Now we only use bottled agar powder.

Today for comparison of various colour procedures in clinical biochemistry, spectrophotometers and electric colorimeter are used. Autoanalysers are also taking over. When micromethods were used and comparisons carried out in the visual colorimeters using daylight, the results were as accurate for clinical purposes as they were now specially when the low and high controls were used simultaneously.

It was during the late 1940s, that copper sulphate specific gravity method was used for estimating total blood proteins and also haemoglobin. The method was reasonably accurate. Such a method

could be used in a field laboratory and for survey work even today.

Diagnosis of a case of fever was always a problem. An early diagnosis had to be made and the pressure was even more with antibiotics like chloramphenicol. One could examine blood films, look for malaria parasites and apparent leucocyte count thereby eliminating a large number of disease syndrome associated with leucocytosis or shift to the left. Urine was tested for urobilinogen. In the absence of uro-bilinogen, the case was unlikely to be malaria.

Normal count or leucopenia indicated that the disease could be typhoid, hepatitis or dengue, unless an outbreak of influenza had occurred in the community. Observations* led to what was described as Gupta's test. The mere presence of eosinophils in the blood film with normal leucocyte count during the first two days of fever indicated that the case was unlikely to be typhoid. Observations on total eosinophil counts indicated that if the eosinophil count was more than 50/cumm with associated leucopenia, it was unlikely that the case was typhoid fever. During the last 25 years we have never made an error in this observation. It should be emphasised that this test held true during the first two days of fever when the blood culture was invariable positive for *S. typhi*.

Progress or otherwise in a case of non haemolytic jaundice by examining the urine colour and taking into consideration the specific gravity of the urine was another simple procedure[1]. This obviated the need for testing blood bilirubin each time.

Garlic juice is popular these days for prevention of heart disease. Anti-bacterial properties of fresh garlic juice *in vitro* were tested and it was used in clinical conditions specially in dealing with septic wounds[2]. Garlic juice was very efficient for dressing septic wounds and ulcers and could replace chemicals or anti-biotics for this purpose.

One can mention calculators as an example. Originally, we used the abacus. It is still used in many countries despite advancement in electronics. We then passed on to calculations on paper. Soon enough hand calculating machines were being imported. Today, even a small shopkeeper uses an electronic calculator.

We have always talked of rising expectations of the people almost causing a revolution in the demand and consumption patterns of our society. After all, this pattern is created by the manufacturers through the mass media. CAT scanner and endoscopes were shown on the television recently. The villager wants an injection for every ailment. These trends create demands and expectations. How long shall we tell the rural masses, that simple medicines given through the community health volunteers can be adequate ? They might turn round and ask when they would have the CAT scanner.

Technology in a society at any given time is used because of forces which are beyond human control. The productive forces throughout the world interact with the political factors and intervene and decide the level of technology to be used for a particular kind of production in any

*The author is indebted to Dr Satyavati Chandra, for help in making many of these observations.

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given society. Many of us know that this question has been repeated *ad nauseam* for import of technology and know how for setting up industries in developing countries. Advanced technology for the future was just not available. The poor countries had the choice of using the one which was to be taken off the design boards soon. The appropriateness of a technology depended on providing for the minimum needs of a given society and also ensuring that the future was taken care of. Such a definition could ensure that we would not take to what has been described earlier as a low cost intermediate technology. In seeking an appropriate technology a quantum jump may be needed and electronics may be necessary to solve the local problems at the village level. We have always wondered at the quality of the village goldsmith producing such fine piece of gold microcirantry. Could he not take to electronics ? What about those who write complets on a grain of rice ?

Let us have a look at other sectors of the like and the kind of technology which was advocated in pre-independent India when the Gandhian thought dominated the scene. Small scale and village industries were so much a part of national thinking. The reports of the National Planning Committee laid emphasis on it. Even in the documents of the Second Five Year Plan, emphasis was given to the development of small scale industries.

A parallel development could be seen in the concept of basic education in which work experience was so much a part of the learning process.

Historically speaking what happened to the concepts of Gandhi, Kumarappa and Madan Mohan Malaviya of the National Planning Committee, and of Mahalanobis[2]. After independence, during the last 25 years we replaced them with capital intensive, imported, energy rich technology. We set up the heavy industries replacing even coal by disel. We set up the medical colleges at par with Western requirements, thus converting them into excellent export-oriented industries. The trials and tribulations of our primary education are indeed too well known. The number of illiterates today continues to increase.

Did we have a choice? In a shrinking world, the new scientific and technological revolution was based on electronics, polymers, nucleonics and genetics. The mass media created new expectations among the people. All the concepts of low cost, low energy technology were left by the wayside of history. There were, however, interesting things to note. We took to the Western model from them both in ideas and substance. Today we are flooded with high pressure compaign from them that we should rediscover intermediate—low cost—labour intensive technologies.

Let us pause and ponder. India, given the necessary political will, is on the point of a take-off in all sectors especially because of its being third largest trained and skilled man power. Shall we reverse the process? There is no such thing as 'intermediate' or 'appropriate' science. We should opt for science based technology—even if it is on a small scale.

Societies and individuals do not, however, have the choice of the epoch in which they exist. They cannot decide the nature of the problems they confront.

With this we may end our sojourn to 'appropriate' technology, the time being now appropriate for us to return to the realities of life ! A technology can only be appropriate in terms of development and a time frame without which the technologically backward countries may remain backward for ever.

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Appropriate Technology for Primary Health Care, 1981 pp 54-64

Appropriate technology for oral health care

Amrit Tewari

Department of Dentistry, Postgraduate Institute of Medical Education and Research, Chandigarh

Advancing frontiers of medical technology have now created an atmosphere of positive health care. The falling infant mortality rate, reasonable control of epidemics like smallpox, plague and diphtheria *etc.* and rising life expectency added to the breakthrough in many fields of medicine gave birth to the concept of 'total health'. In this perspective dental and oral diseases assume priority because once the cloak of death under whose shadow the child was living is lifted, these diseases with low mortality but rampant prevalence and cripling consequences become significant.

The Indian situation : exploding a myth

One myth about dental disease which has diverted our attention from them is that they are the curse of the rich Western society, from which the less affluent societies are blissfully free. While looking at the global picture of dental caries, it becomes apparent that the dental caries started with the West, got spread to the Far East involving Japan, Malaya, Singapore, Hongkong, Indonesia and has now reached India. Once it has gained its foothold in the Indian sub-continent, over the decades it has shown steady progress in prevailing over larger pro-portions of the population. Thus, while the prevalence was reported to be 36·51 per cent in 1947, in 1980 it was around 90 per cent (Table I).

Interpreting our data from studies on urban population in Chandigarh and the

Table I. Increasing prevalence of dental caries in India

Year	Author		Percentage of population with dental caries	Remarks
1947	Shourie[15]		36·51	Involving different parts of north and south India
1952	Vacher[16]		51·67	In Punjab, 8-13 yr age-group
1953	Thaper[17]		59·10	Punjab, 6-20 yr age-group
1973	Ramachandran and Rajan[18]		66·20	In Madras adults
1974	Tewari and Chawla[1]		81·60	In Chandigarh, 6-16 yr
		DMFT	2·88	
1979	Tewari and Reddy[2]		89·03	Rural Punjab, 12-17 yr
		DMFT	4·84	

rural population in Bhatinda district in Punjab, we concluded that dental caries is a major problem involving more than 80 per cent of the children in our cities and villages, by the time the child grows up into a youth, at least 6 of his teeth would fall prey to tooth decay[1,2]. The concurrence of our data with that of the other studies from other parts of India, proves that, this is, what is to be expected at the national level also.

The second major dental disease is the periodontal disease, which is prevalent almost in the whole of adult population of India, varying only in severity from one individual to another[3]. But the alarming feature is that, like dental caries, over the years the incidence of periodontal disease in the child population also shows a trend towards an increase (Table II).

In the year 1976, we examined 1511 school children in the age group of 6-16 yr in two schools in Chandigarh[3]. Our results showed that the severity and prevalence of periodontal diseases increases with age. At the age of six, eleven and sixteen years 64·71, 97·09 and 100 per cent children respectively had the disease with mean PI score of 0·158, 0·979 and 1·454 respectively (Table III). These results were similar to those reported by other authors.

In another study in 1970 we reported the prevalence of a third dental disease-malocclusion in Chandigarh school children[4] as 38·16 per cent, again in agreement to other similar studies.

In spite of the lack of a homogenous national oral health survey, we can safely presume that the map of dental diseases in India at present will read like this :

Table II. Increasing prevalence of periodontal diseases in Indian children

Year	Author	Age group years	Percentage of study population with periodontal disease
1944	Day[19]	10	75·00
1965	Dutta[20]	6-12	89·90
1967	Vacher and Gupta[21]	12-20	86·63
1969	Nanda and Khurana[22]	4-17	97·00

Dental caries (%)	: Adults		: 65
	Children		: 80-90
Periodontal disease (%)	: Adults		: 95-100
	Children		: 90-95
Malocclusion (%)	: Adults and children		: 40

The causes of this universal prevalence have normally been attributed to poverty, the lack of dental health awareness and above all the dismaying dentist-population ratio of 1 : 80,000 in India. We know that 80 per cent of dentists are clustered in urban areas while 80 per cent of the Indian population lives in villages, thereby making the urban population frequently exposed to the dental clinics with an easy access to dentists; yet, the prevalence of dental diseases in the cities is never less than that in the villages. We may conclude from this, that just narrowing the dentists-population gap by producing more dental graduates may not solve the whole problem.

Table III. Prevalence of periodontal diseases in Chandigarh school children (Tewari, Chawla and Malik)[3]

Age in years	No. of children examined	Children with periodontal disease		Mean P.I. score*	Standard error
		No.	%		
6	68	44	64·71	0·158	0·024
7	100	88	88·00	0·412	0·038
8	178	154	86·52	0·651	0·039
9	156	141	90·38	0·786	0·042
10	160	154	96·25	0·939	0·050
11	172	167	97·09	0·979	0·044
12	216	208	96·30	1·052	0·046
13	160	155	96·88	1·132	0·046
14	173	167	96·53	1·036	0·040
15	82	73	89·02	0·990	0·069
16	46	46	100·00	1·454	0·150
Total	1511	1397	92·46	0·880	0·016

*Periodontal index by Russel[23]

Knowledge, attitudes and habits :

Perhaps the answer lies somewhere in the deep maze of knowledge, attitudes and habits of our population. As a part of a large evaluation programme of knowledge, attitude and practice of 25 occupational groups, launched in the field and presently under study, we have analysed the data from seven occupational groups comprising 451 individuals[5]. Of these seven occupational groups, four *viz.* doctors, engineers, university teachers and postgraduate students represent high education level, two *viz.*, industrial workers and agriculturists had, on the average, education up to primary or middle school level and the last group of farm labourers were on the whole uneducated.

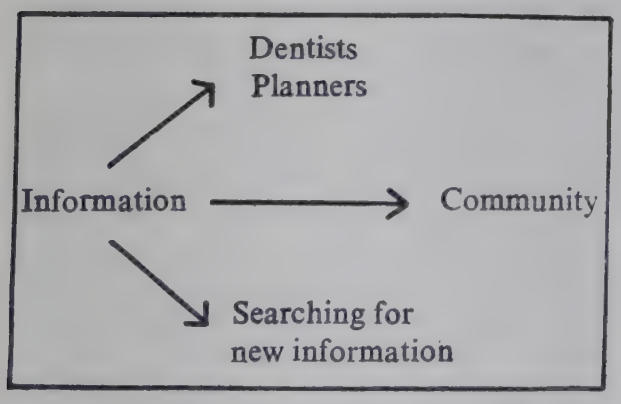
Our results revealed unsuspected answers. Only 13 per cent of agriculturists and 5 per cent of farm-labourers never cleaned their teeth. Brushing was the mode of cleaning for the high education group, and 75 per cent of industrial workers. The agriculturists and farm labourers mainly (75-80%) used substitutes (*Datoon*) for cleaning their teeth. The reasons behind not using brush for cleaning their teeth were rarely economical (3 out of 17 in the industrial workers group only) but rather, compulsion of habit, tradition and customs. The most striking results were obtained when we

asked which is the best method of cleaning the teeth. Even many of the highly educated groups using brush believed *Datoon* and other substitutes were better than the brush (3% of doctors, 22 to 24% of engineers, university teachers and postgraduate students). Perhaps *Datoon* is drilled into our subconscious as a superior method of cleaning the teeth even when it is proved that its cleaning capacity is just 26 per cent, about two times less than brush[6].

Thus we are faced with the problem of highly prevalent diseases compounded by false knowledge, wrong attitudes and bad practices. Solution for this problem lies in getting and supplying the right information and implementation of well planned structured programmes for prevention of dental disease as well as the restoration of oral health.

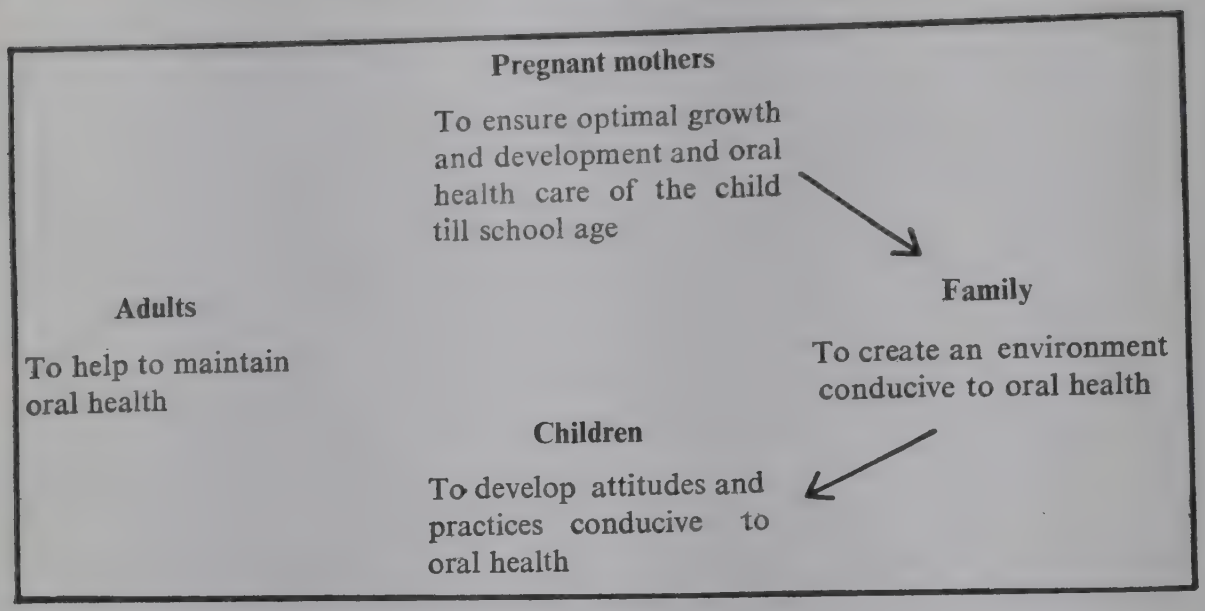
Information

Information is gathered as knowledge, based on which one may act; the very process of doing so alters attitudes and beliefs :



In the list of consumers of information, the dentists, health planners and community are included. Information to the dentists and the planners at the decision making level, should come through realistic surveys of dental health situation of the country, and to the dentists at the practice level through continuing education programmes to update their knowledge. Since knowledge is a dynamic process, there should be provisions for searching out new information through research. The most sensitive member of the consumer forum for information is the community because it consists of a heterogenous group : socio-economically, education and age-wise, in the predeliction to the diseases and acceptance of information. We conceive of an information programme for the community (more conveniently called as Dental Health Education) spanning the total life of the individual, starting even before his birth by contacting the pregnant mothers.

Pregnancy is a time when the woman is more susceptible to periodontal and gingival disease and is more amenable to information regarding her child. By educating this group, we are able to achieve the dual benefits of caring for a group with disease predeliction and also of inculcating preventive health knowledge at a time when it is more readily accepted. This ensures the conditions for optimal growth and development and oral health care of the child till he leaves home for school. Furthermore, when the child is two years old and again at four years, the mothers are contacted to reinforce the knowledge. The family unit requires special attention because it is the immediate environment in which a person grows up. Programmes directed at the children help to develop attitudes and practice conducive to oral health. Whatever we achieve at a young age has to be maintained by continuing education in the adult life.


Pregnant mothers
To ensure optimal growth and development and oral health care of the child till school age
Family
To create an environment conducive to oral health
Children
To develop attitudes and practices conducive to oral health
Adults
To help to maintain oral health

If feeding the community with information would improve preventive health behaviours, there is also another facet to it; increasing awareness need for the treatment in turn increases about the demand to be treated. The extent of the disease prevalence multiplied by the enormous cost of treatment would be disastrous if we had to treat everyone. Only in the dawn of the present century, we had the semblance of any such miracle—the discovery of dental caries preventive action of fluoride.

Fluoride : The magic bullet

Our natural environment is rich in fluoride with the earth's crust containing 880 ppm, soil 200-290 ppm, sea-water 0·8-14 ppm and air 0·05 to 2$\mu g/m^3$. The main source of fluoride to human body is through drinking water. In addition to its presence in nature, fluoride is attractive as a preventive measure because of the many ways it can be utilised (Table IV).

In India artificial water fluoridation has not been instituted. But there are pockets of naturally fluoridated community water supply where the effects of systemic fluoride on dental caries can be studied. Two field surveys were completed by the Department of Dentistry, PGI Chandigarh, studying the interrelationship of dental caries and different fluoride levels in the drinking water in Bhatinda district of Punjab, an endemic fluoride area[2,7]. Highlights of these studies are presented in Tables V and VI.

These results are clear indication that maximum caries protective activity of systemic fluoride is between 0·80 and 1·00 ppm in drinking water. Levels, both above and below these, are not desirable, since caries increased with increase and decrease in fluoride level in drinking water beyond these limits.

While fluoridation of drinking water requires active participation of legislative and public health authorities to implement, it is also not feasible in India as 70 per cent of Indian population does not receive piped water supply. Topical fluorides can be easily implemented in

Table IV. Fluoride in dental caries prevention : ways and means

Mechanism of action	Population served		
	Community	Group	Individual
Systemic	Water fluoridation Milk fluoridation Salt fluoridation	Fluoridated school water supply Fluoride supplements	Fluoride tablets
Topical	Fluoride dentifrices Fluoride mouth washes	Topical fluoride application Fluoride dentifrices Fluoride mouth washes	Topical fluoride application Fluoride dentifrices, Fluoride mouthwashes, Fluoride containing fissure sealants and restorative materials

individual population groups with safety. As it is, our market is flooded with fluoride tooth pastes, which if we use may exert a caries reducing effect ranging from 13 to 34 per cent as found by studies abroad[8,9].

A $4\frac{1}{2}$ years prospective study of the effect of topical fluorides like sodium fluoride, acidulated phosphate fluoride and a fluoride varnish was conducted by us[10]. Though sodium fluoride and acidulated phosphate fluoride showed initially 20 to 35 per cent reduction in dental caries, at the end of the study their efficiency was reduced greatly. The fluoride varnish (Duraphat) proved to be the most effective with sustained effect and with minimum reduction in efficiency over the study period: Caries preventive effect being on the average 70 per cent. Cost-benefit analysis from this study proved that it takes twenty rupees to fill a tooth but just eight paise to save it.

Table V. Fluoride in drinkng water and dental caries—age group 3-11 (deciduous dentition)

Fluoride level ppm	Percentage of children with dental caries	dft	dfs
0·30	52·14	2·22	4·26
1·10	13·17	0·40	0·65
2·00	23·68	0·59	0·97
5·40	24·53	0·86	1·54
10·40	49·43	1·33	2·00

Role of tooth brush in prevention of dental diseases

In November, 1975, WHO held a seminar on the 'Management of Diseases on a Public Health Basis[11]. This

Table VI. Fluoride in drinking water and dental caries—age group 3-11 years (permanent dentition)

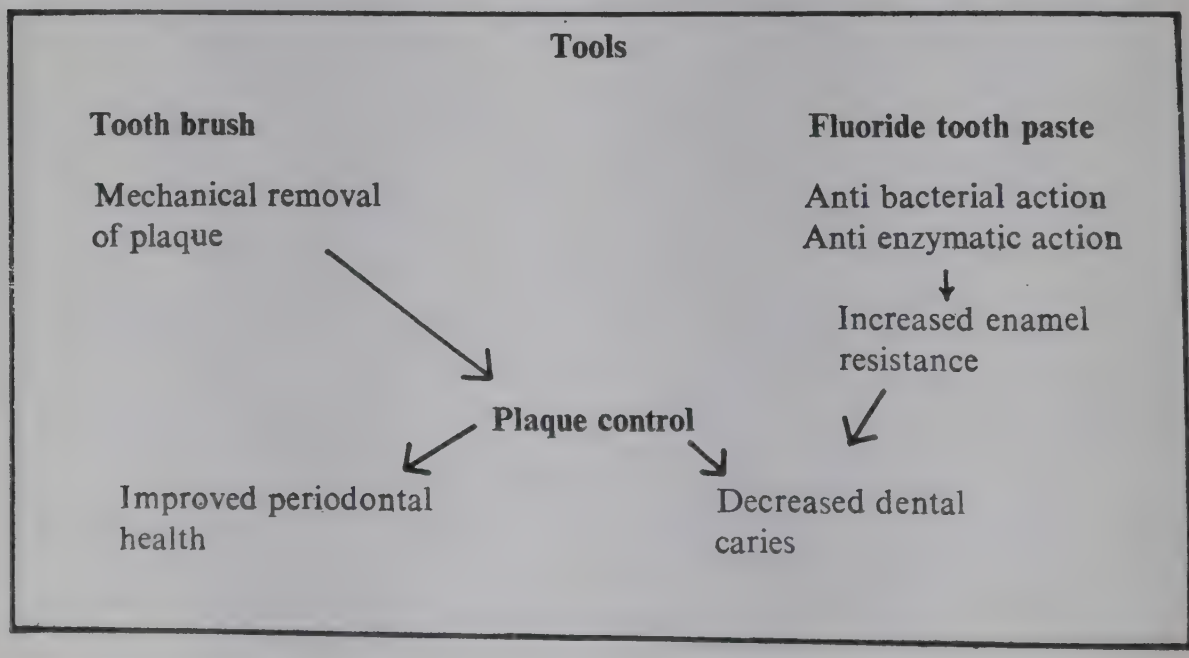
Fluoride level ppm	Percentage of children with dental caries	DMFT	DMFS
0·30	51·04	1·36	1·76
1·10	17·16	0·49	0·69
2·00	29·89	0·91	1·07
5·40	37·43	1·25	1·42
10·40	48·88	1·35	1·75

seminar unanimously agreed that the common denominator in the etiology of dental caries and periodontal disease is the bacterial plaque which is a concentrated culture of micro-organisms tenaciously attached to the tooth surface by a matrix substance. The most important tool to control plaque is the tooth brush. Coupled with the fluoride dentifrices it offers a simple and cheap preventive dental care system effective against the two major dental diseases.

Sugar and dental caries

Dental caries has been described as the result of interaction between susceptible tooth surface, pathogenic bacteria and conducive diet. While fluoride can increase the resistence of the tooth surface and correct tooth brushing can remove the bacterial plaque, the diet conducive to dental caries has to be controlled by stringent measures. The most important dietary factor in caries etiology is sucrose. The effect of sucrose on modulations of *p*H of dental plaque from children with different caries experience was studied in our department (Table VII)[12].

Results from this study showed while in mouths in which dental caries was absent the fall in *p*H was minimal and within 30 min the original or resting *p*H was reached; in the case of mouths with more dental caries, the hydrogen ion concentration increased with the severitn of caries attack and the recovery way not complete even after 30 min. It was also deemed fit to study the cariogenic



potential of commonly used non-alcoholic sweet beverages by monitoring the dental plaque *p*H (table VIII)[13].

The striking feature in this study was the high cariogenic potential of *shikanjvi* which is considered as a health drink. Milk had least effect on plaque *p*H. The children in this study had a caries rate of 3-5 DMFT equivalent to the moderate carious groups to the previous study. In the light of this, the geater delay in recovery of plaque *p*H after consumption of *shikanjvi* is thought provoking.

The third study in this series involved commonly consumed solid sweets in India. Results from this study also reiterates the high potential for cariogenesis present in solid sweets commonly used in India (Table IX)[14].

The cariogenicity of sucrose and sucrose containing sweets and beverages available in India are thus well demonstrated. Since sweets are an integral part of the life experience of a child and has similarly an important cultural role to play as the symbol of auspiciousness, the dietary restriction of sugar has to be done with discretion and intelligence. The intelligent use of sugar implies that regardless of the amount, the people should cut down the number of sugar intakes per day. It is advisable to restrict sugar intake to three times a day.

Table VII. Effect of 25 per cent sucrose mouth rinse on the modulations of dental plaque *pH* in relation to different caries experience[12]

Caries experience	Dental plaque *p*H				
	Pre-rinse	After 5 min	After 10 min	After 20 min	After 40 min
Caries free	7·00	6·86	6·92	6·94	7·00
Moderate caries	6·90	6·52	6·58	6·64	6·70
Rampant caries	6·80	5·46	5·46	5·88	6·40

Table VIII. Cariogenic potential of common nonalcoholic sweet beverages used in India[13]

Drink	Pre-drink resting *p*H	Dental plaque *p*H post drink afte r			
		5 min	10 min	20 min	40 min
Milk	6·86	6·47	6·51	6·66	6·75
Coca Cola	6·83	5·99	6·33	6·00	6·64
*Shinkanjvi**	6·84	5·32	5·65	6·04	6·27

*Made from fresh lime, sugar and water

Table IX. Cariogenic potential of common solid sweets used in India[14]

Sweets	Pre-consumption resting *p*H	Dental plaque *p*H post consumption			
		5 min	10 min	20 min	40 min
Rasgulla	7·33	6·41	6·16	6·59	6·75
Burfi	7·27	6·39	6·29	6·33	6·73
Jalebi	7·22	6·54	6·06	6·21	6·50
Bread and jam	7·36	6·47	6·23	6·48	6·67

Dental health education, fluoride, tooth brushes, and restriction of sugar forms the essential tools necessary for dental health care technology.

Implementation of dental health care programmes

In the hierarchy of implementation of dental health care programmes, there are two groups : providers and consumers. The providers include dentists and auxillaries while the community is the consumer.

Dentists : In contrast to the traditional doling out of treatment the dentist has now assumed the role of the leader of a team. In addition to this administrative duty he should also be able to prepare and execute viable training programmes for auxillaries, evaluate the results of any such programmes, prepare information for the community and offer restorative care with special attention for the high risk groups. The dentist is responsible for implementation and supervision of dental health care programmes, exerting dynamic control over vulnerable areas.

Auxillaries : The specially trained auxillaries would be the first to contact the pregnant mothers, and help the dentist in imparting information to mothers, children and the community as a whole. They will also institute prophylactic care in schools and community which will include brushing demonstration, scaling and polishing, mouth rinsing and topical fluoride applications. The main part in the follow-up programmes is played by the auxiliaries.

Community : In the community, the members shall be actively involved in antenatal programmes, pre-school care, school health programmes which will be instituted as incremental oral health care. The incremental oral health care helps to produce feasible means of involving the total school child population, over a period of time, thus, increasing the chances of success. In the adults the dental diseases are rampant and are already established and advanced, so that it is not easy to achieve total oral health. A more realistic goal will be to offer relief from emergencies and restrict the progress of disease in them with the help of dental hygienists.

The traditional concepts in dental sciences have shifted with improvement

in overall health status of population. It is no more possible to ignore the high amount of dental disease prevalence in the Indian population. It is also not feasible to offer complete treatment facilities for them. Since the dental science is basically preventive, it would be better to aim our programmes towards the young than the old in whom the diseases are already established and are in advanced states with very little scope for recuperation. So our motto should be to catch them young.

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Appropriate technologies in medical equipment for primary health care

Reghbir Singh Khandpur

Medical Electronic Instruments Division, CSIO, Chandigarh

Modern technology and decades of unprecedented progress have by-passed the problems of people in rural and urban slum areas. The overall health scene continues to be a pathetic sight in developing countries with infant and maternal mortality rates several times higher than in some of the developed countries, lack of potable drinking water to a sizable population, deficiencies in intake of balanced foods, rampant poverty, illiteracy and widespread communicable diseases. Admittedly, medical instrumentation has a limited role in correcting this imbalance. However, the real challenge to technology is not so much in developing new technology but of simplyfying it so as to add functionality to it. Simplification is important so that people with limited amount of training and supervision may be able to apply it. In this context, one of the former Directors General of WHO, while discussing health services in the developing countries, once stated, "when one thinks of the enormous efforts that the newly independent countries have made to liberate themselves, it is perhaps surprising that they have not realised that they need to free themselves from what might be called a technical colonialism as well." This is not to belittle advances in clinical chemistry, microbiology, biochemistry and other equipment of direct patient care, but what he stressed was that technology for health care must be appropriate to suite local conditions.

Some of the special problems inhibiting the use of medical electronic equipment in the primary health centres are : (*a*) lack of electricity; (*b*) discontinuous supply of reagents; (*c*) rough handling due to inadequate training of operators; and, (*d*) damage to commonly used components due to hostile environments. Medical equipment for primary health centres must be simple in design and operation, reliable, sturdy; should need little maintenance and be of comparatively low cost. Running expenses should be small.

The most important component in the health organisational pattern is the primary health centres and upgraded rural health centres. They need to have basic equipment and instruments so that some diagnostic and health care facilities can be provided. During the last decade, there have been fairly consistent efforts at the national and international levels for meeting this requirement and equipping primary health centres with basic equipment. An international Biomedical

Engineering Workshop was held in Yugoslavia in 1972 and the problem of using innovative technology for mobile and remote medical care delivery was extensively discussed. The following problems were identified :

(*a*) most medical equipment has been designed for use in high technology environments. Therefore, appropriate designs for equipment required for primary health care remains an unexplored area;

(*b*) developing countries at present buy equipment, which is too sophisticated for their needs and resources. They may not readily accept equipment, which is not used in developed countries because it may seem to be an inferior substitute, but in reality is the best for their needs.

(*c*) the availability of equipment for primary health care is the single most limiting factor. Simple essential equipment, which is easy to repair is the most difficult to obtain. Until and unless the biomedical engineers remedy this deficiency, and give it priority over the development of increasingly sophisticated equipment, no significant changes are likely to occur.

(*d*) before embracing new design philosophy, manufacturers will look for evidence for substantial demand. The scattered demand will not support cost of new designs and manufacturing techniques.

(*e*) lack of adequately trained equipment maintenance technicians is universal, from the most developed to the least developed nation. This aspect requires the establishment of training centres for such technicians who may look after day to day problems in the primary health centres. Besides this, it is essential to develop basic equipment maintenance manuals, in all languages, with special emphasis on simplicity and clarity of instruction and direction in maintenance and repair of essential instruments. The list of equipment identified by this group for primary health centres was exhaustive and was based upon the level of the primary health centre, with scope for possible expansion of facilities.

WHO set up a task force in 1979 to identify some of the important pieces of clinical laboratory equipment which may be required in PHC's and has worked out a plan of action for designing and fabrication of the same, under its supervision. Some of the items selected by WHO are seemingly simple but require the development of innovative technologies to meet the laid down requirements.

Central Scientific Instruments Organisation (CSIO) became interested in the area of appropriate technology for primary health centres in 1978. As a first step, it organised a 3 day seminar on Technology for Rural Health Care in November 1979. The main objectives of this seminar was to identify the instrument requirements for health care in rural areas. The seminar brought together experts from various spheres like Medical Services, Health, Management, Engineering and Research Design and Development institutes. It was thought possible to activate and enlarge rural health care, its scope and content, through the use of innovative technologies. It brought home the realisation that while at present the technology requirements might not

be very sophisticated, yet the special features could not be ignored. As a result of this exercise, the following equipment were identified as essential for the primary health centres :

(*a*) Bicycle driven ambulance.

(*b*) Colour strips for temperature measurements or clinical thermometers with colour bands.

(*c*) Weighing balance for children and adults.

(*d*) Rugged colorimeters.

(*e*) Incubators.

(*f*) Mechanised dispensing of medicines.

(*g*) Anaesthesis equipment with control of fixed amount of ether with each operation.

(*h*) Cheap and effective health education kits.

Development of appropriate technologies for primary health care at CSIO, Chandigarh :

After this Seminar, CSIO took up the development of some of these items and some others which may be useful in the primary health centres. CSIO has been getting support and guidance from the Community Health Department of the Postgraduate Institute for Medical Education and Research Chandigarh in this project. Work on the following projects has been continuing since then with considerable success.

(*a*) *Cycle ambulance* : This ambulance (Fig. 1) has been developed for use in rural areas for transportation of emergency patients from a village to a primary health centre. Its main function is to bridge the gap for patient transportation

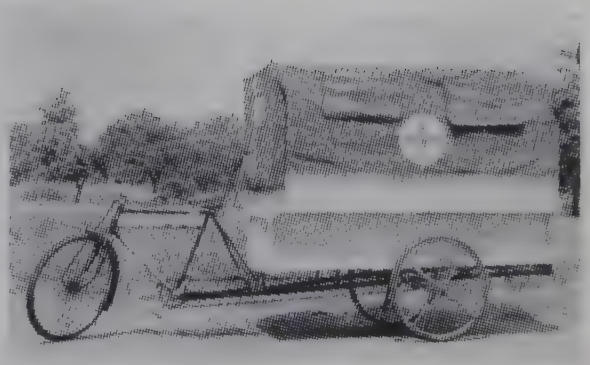

Fig. 1. Bicycle driven ambulance

existing between the motorised van and other means of transport (*e.g.* truck, trolley, bullock cart, cot *etc*). It is presumed that one such ambulance will be available in each village under the control of village panchayat.

The ambulance has one stretcher for the patient and a seat for one attendant. Also, there is a medicine box for keeping essential first aid medicines which can be administered to the patient by the attendent. It provides shelter from rain, heat and winds. At night, light within the ambulance can be provided with a kerosene lamp or torch whenever required. For natural wind circulation and lighting, the ambulance is provided with five small windows.

(*b*) *Thermometer with colour band scale* : As per the information available from the Community Medicine Department of the PGI, the community health workers are by and large semi-literates. Often, it is difficult for them to read the normally graduated scale of the mercury-in-glass clinical thermometer. This problem can be circumvented by calibrating the thermometer in terms of the following three colour bands :

Green — Temp. range 97·5° to 99·5°F.

Yellow — 95 to 97·5 F and 99·5 to 104°F

Red — Below 95°F and above 104°F.

Various techniques of doing this have been tried out at the CSIO. In case, a reasonably good market is ensured, CSIO can have a dialogue with some existing manufacturers of clinical thermometers to manufacture thermometers as per this design.

(*c*) *Vasec Apparatus* : Vasec apparatus (Fig. 2) has been developed to provide a reliable effective, durable yet simple and inex pensive instrument for use in vasectomy procedures. Specifically, the in strument provides bipolar electrocoagulation of the vas deferens lumen to achieve quick healing of the vas with a minimum of trauma, scar tissue, and sperm antibody formation. It provides a maximum effectives terilisation of the male while maintaining the best possible conditions for surgical reversal.

(*d*) *Foetus stethoscope* : The instrument is used to detect foetal life earlier and with greater consistency than other methods presently being used. The instrument provides a fast, safe and reliable method for detecting foetal heart beat sound as early as twelfth week of pregnancy. It permits the follow up of foetal life throughout pregnancy and detection of foetal distress. It is light weight, picket sized and operates on chargeable battery.

(*e*) *Minicardioscope* : Minicardioscope has been designed for instant diagnosis in emergency situation. Conventional ECG machines are not well suited for instant field use because they are heavy and usually operated on electricity. The

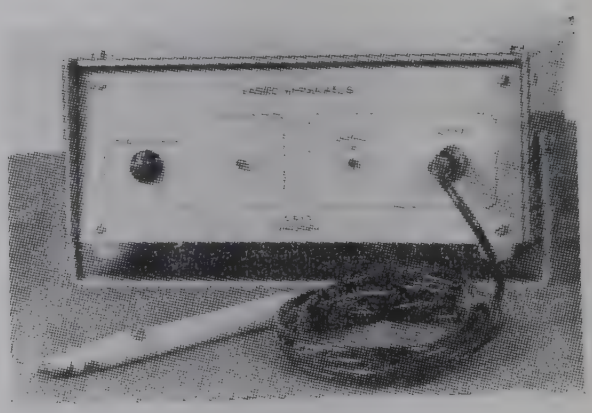

Fig. 2. Vasec apparatus

instrument is completely cordless and is battery-operated, with integrated electrodes for direct application on the patient's thoracic region. It has a high strength fibre-glass case and can easily be held in one hand. The instrument displays a perfect ECG on a 5·5×3 cm rectangular screen.

(*f*) *Colorimeter* : The commercially available colorimeters suffer from several defects, when critically examined and used in the primary health centres. For example, they have a fragile meter, vulnerable photocells and filters which deteriorate in hot and humid atmosphere, and the rheostat used for controlling the light intensity easily get damaged in extreme climatic conditions *etc*. CSIO is working on the development of a colorimeter which will reduce some of these problems. It is also proposed to make cheap dedicated instruments for different parameters like total protein, glucose, urea, haemoglobin *etc*.

All these projects have been undertaken in the laboratory with the hope that they will be commercially exploited, However, the manufacturers will have to be assured of a reasonable market for the products. In order to give a boost to

this activity, the primary health centres will have to be provided with extra funds to enable them to go in for such equipment which may meet the odd and stringent requirements and performance standards.

Another area where CSIO can help the introduction of appropriate medical equipment at the primary health centres is the training of technicians from the centres, for the maintenance of instruments. In fact, the operators of instruments can be easily trained in the repair of those few instruments which they are expected to operate. The training programmes will require extensive planning because of limited educational backgrounds of instrument operators. CSIO will be happy to undertake the job and contribute to the development of primary health care in the country.

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Resource mobilisation for primary health care

K.S. Sanjivi

Voluntary Health Services, Adyar, Madras

For purposes of our discussion today, we will define Primary Health Care simply as all health activities that may be carried out at the interface between the Multi Purpose Workers and the community. This is the area where the official hierarchy of the workers terminates and the consumers of Primary Health Care start seeking assistance.

As a result of our experiments over the past decade, we consider the following as the essential requirements for primary health care. (1) A health post manned by a Lay First Aider for every 200 families/1000 population (2) A male and a female Multi-Purpose Worker for every 1000 families/5000 population. (3) A doctor being available at the mini-centre for at least 3 hours a day on 3 days a week (4) The identification of, and liaison with, a referral hospital within a reasonable distance.

While this pattern will be applicable to all rural areas a modified and less expensive pattern is suggested for urban areas. An urban health centre will not cover 1000 continguous families, as the rural mini health centre, because this is not necessary in the more affluent areas. However, primary health care in the entire community should be the concern of the urban and rich also and not only that of the rural and poor. It has been estimated that about 50 per cent of the urban population live in slums or multi-tenented quarters which have been called 'Bastis', 'Stores' *etc.* in different parts of the country. The unit for an urban health centre therefore will not be 1000 families but may be only 300 to 500 families in one slum/poor area. Also in urban areas the medical institutions are many and more easily approachable.

When we talk of resource mobilisation we should consider not only the money but also the materials and manpower required to operate a scheme. Considering that these health care services should be introduced into as many areas as possible, with the target of covering the whole country before 2000 AD, no time or money should be spent on constructions for locating the health centres. In the Mini Health Centre project operating in nearly 200 locations in the various districts of Tamil Nadu, we have insisted on the community itself providing two rooms and the minimum furniture for conducting the programme. While in every area this has been done by the local community, without any delay whatever, in a few areas the community has subsequently raised the money for a separate and 'pucca' building.

Another item under materials will be mobile vans/jeeps. Here again we feel that the health centre should be functioning on a permanent basis for 6 days in a week. The Lay First Aiders/ Community Health Volunteers looking after 200 families or 1000 population will be permanently resident housewives available all the seven days of the week and all the 24 hours. The Multi Purpose Worker must also live within a cluster of villages providing the unit of 1000 families/ 5000 population and not outside. Only the doctor commutes from an urban or semi-urban area to which he returns after his three hours' stint at the health centre. He will have his own two wheeler perhaps and there should be no expenditure of any kind on transport incurred by the organisation sponsoring the health centre.

Other items to be discussed under materials will be safe drinking water, nutrition supplements and drugs. The first two will be focussed on the needs of children below the lower line in the Road to Health chart and pregnant and lactating mothers in families below the poverty line. These subjects are identified in the area of each Lay First Aider/Health Post for 200 families and arrangements made to provide them with boiled water, paladai (the open, native feeding cup instead of the modern hard-to-clean feeding bottle) where breast feeding is not enough or not possible. The slogan 'back to the breast' is an essential component of our Health Education activities. In every village the possibility of owners poultry/cattle gifting the nutritional supplements of these persons estimated at 15 per 1000 is explored, with success in many cases.

A similar idea in urban slums is planned—large hotels, well-to-do families requested to adopt some needy children/ lactating mothers for a few months until the danger period is got over, only for the free supply of food supplements. Studies have shown that it is cheaper and wiser to provide more calories to the lactating mother to continue breast feeding than artificial infant feeding practices.

In some areas the first month's supply of a Multi-Purpose food was given free, and when the mother saw the benefit to the child she raised help herself to pay for it, for the next three or four months. It is a pity that rural school and kitchen gardens, started as part of the Applied Nutrition Programme, have not thrived on a long term basis. Research into the causes and remedies for this situation is urgently called for.

Drugs, their list for a Mini Health Centre and their share in the annual budget, present a problem. It should not, provided the Doctor/Multi-Purpose Worker at the health centre understands the scope, functions and limitations of the Mini Health Centre as distinct from a referral hospital and uses the latter diligently. It should be possible to insist on the Mini Health Centre restricting itself to an approved list of 'primary drugs'. For example, if enteric is suspected, the case should be sent for in-patient care to the referral hospital and not be handled on a domiciliary basis with the administration of chloramphenicol. This, indeed, was a specific moot point at one of the biannual seminars on Mini Health Centres held in Tamil Nadu.

The budget of Rs. 60,000 proposed to be raised to Rs. 80,000 per annum,

in the Mini Health Centre Scheme is much more than what is available now under the government schemes (Rs. 20,000 Primary Health Centres; Rs. 20,000 at 10 sub-centres, Rs. 20,000 mobile unit), and only Rs. 40,000 where there is no mobile unit.

Taking the Multi-Purpose Workers, there is a considerable shortage of Auxiliary Nurse Midwives or the Multi-Purpose Workers (female) under the modified curriculum. The Tamil Nadu Government has therefore permitted voluntary institutions with the required expertise, such as Gandhigram and the Voluntary Health Services Medical Centre, to conduct a short term six months training programme. In many cases the workers with the minimum basic qualifications are sponsored by the agencies running the Mini Health Centres and sent to these training centres. While the need for such Multi-Purpose Workers (female) is recognised to be great, it is regrettable that several applications for conducting this full-fledged programme on the new curriculam have been lying with the Government for over two years. It should be stressed at this point that the authorities should be alive to the urgency for training para-medical personnel in thousands.

As regards the part-time doctor, doubts have been expressed in certain quarters whether a regular input of a doctor is at all necessary at the level of the 5000 population. Panjab provides a full time doctor for 10,000 population, while the doctor sits only at the 100,000 population level at present, as well as in the recent Study Group report; ours is a more realistic compromise between the two.

It is regrettable that the education of the under graduate is still preparing him to be the leader of a sickness team rather than a health team. While it may be granted that the emphasis in the activities of health centres should be on preventive and promotive care, curative medicine cannot be neglected or compromised. For example, even a villager can suffer from enteric, pulmonary tuberculosis, leprosy; coronory attacks or a cerebral tumour. While the Para Medical Workers can carry out health education with an emphasis on prevention and also render symptomatic treatment for short periods, correct diagnosis is imperative when the situation demands. It is only a fully qualified medical man that can be trusted with the diagnostic possibilities in difficult situations and the knowledge to utilise the referral hospital to the maximum advantage of the patient.

Appropriate technology in the area of health should not mean attention only to prevention and minor illness but should include everything essential to save human lives. That is why we have insisted as a fourth step in our definition of primary health care 'the identification of and the liaison with a referral hospital within a reasonable distance'.

The suitability of a hospital for its being used as a referral hospital should be based on its location and available facilities, not on its ownership. It may be a Government, Missionary or other voluntary hospital and should agree to take the referrals from mini health centres and send back the patients after the necessary investigations/consultation/hospitalisation with full notes to enable the mini health centre team to diligently carry out the after care. The Tamil Nadu

Government has issued clear orders on the responsibilities, in the case of such referrals, of every government institution, taluk, district or teaching.

The second problem in referrals is that of transport. Here again, the Tamil Nadu Government has already sanctioned an excellent project for 'accident and emergency medical services' from the primary health centre upwards to speciality centres. We are working on the logistics of extending this downwards from primary health centres to health posts, through mini health centres, and making a study of the alternatives available for the quick transport of patients from the periphery to the higher centres. As already stated, while low cost, intermediate, appropriate technology should necessarily dominate the rural scene, the total health care plan should make provision for such urgent referrals.

Talking of referral hospitals, one should insist on the *area concept* of every hospital serving the population around it instead of the prevailing wasteful, delay-prone model of separate hospitals for different occupational groups (ESI, Central Government, Railways, *etc*). Reports say that President Reagan might have lost his life if he had perforce to be taken to one of the Presidential Hospitals (Walter-Reed or the Naval Medical Centre) instead of being rushed to the nearest, George Washington Hospital.

Let us consider money or finance mobilisation. In doing this we believe in the following four principles : (1) No aid should be accepted from any foreign agency. Primary health care must run for all time and run only on the steam provided by our own Central and State Governments and the community itself. While the community provides free accommodation and furniture, and Rs. 6000/- in cash, the two governments should each pay Rs. 9000/- making available a total recurring amount of Rs. 24,000/-. The breakdown of expenditure will be

	Annual Rs.
Two Multipurpose Workers at Rs. 400 pm each	9600
Three Lay First Aiders at Rs. 50 pm each	1800
Drugs in Kitbag	600
Drugs at mini health centre	4000
Part-time doctor at Rs. 300 pm	3600
Supervision, contingencies *etc*	4400
Total	24000

An urban-mini centre for 2500 population works on a budget of Rs. 9000/- only as follows :

	per annum Rs.
Nurse-aid Rs. 200 pm	2400
Lay First Aider Rs. 50 pm	600
Part-time docter Rs. 150 pm	1800
Drugs	2000
Forms, contingencies *etc*	2200
Total	9000

(2) The services should not be entirely free. Each family should pay per annum 0·5 per cent of its annual income subject to a minimum of Rs. 12 and maximum of Rs. 200.

(3) The urban, rural, rich and poor should all contribute to Community

Health Delivery Combines (COHEDEC) merging rural and urban health centres in an area of 1,00,000 to 2,00,000 population.

(4) Community health should be organised on a joint sector concept, a private sector of primary health care and a public sector of the referral hospitals up to the highest levels, teaching and research institutions. Perfect co-operation and understanding between the two sectors is obviously essential.

While we have suggested that each family should make a token contribution towards health care on the grounds that the family now pays for its food, shelter, clothing, education—not to mention cinemas and toddy—and that such a contribution will ensure much more intimate and consistent participation, the difficulties in making the collections should not be under-rated.

Fee for each item of service is the usual method of obtaining the community's contribution. We prefer however educating the community on a prepayment plan and obtaining this half a per cent even when they are apparently well. One important objection raised by the community is 'why should I pay even this token amount while in the next block services are free'. They however do not realise how little of the needed services actually reached them on the free idea. We have also found that the payments come in smoothly and continuously when the workers at the health centre show dedication and produce a good image.

The Panchayat act (section 116) provides for a local cess surcharge being levied by the Panchayat Unions (subject to a maximum of Rs. 2·50 in the rupee of land revenue) as an addition to the local cess. As per section 129 of the Act, Government pays a matching grant to the Union corresponding to the above local cess surcharge. However, we consider that obtaining the contribution on a voluntary basis rather than as a compulsory cess is more conducive to, and reflects, greater community participation.

In our experience, practically all the residents in the area have got enrolled in the scheme one time or another. But only 60 to 80 per cent renew the membership without waiting for a curative need to arise.

We do not agree with the suggestion that the community should be asked to pay for the drugs alone. The contribution should be for the entire health centre activities; otherwise undue emphasis on drugs will lead to under pedalling of the more important preventive and promotive services.

To the three Ms of money, material and men must be added the fourth M of management. Management has been defined as 'the ways in which large numbers of people too many to have personal contact and engaged in a complexity of tasks, relate themselves to one another in the conscious, systematic establishment and accomplishment of mutually agreed goals'. While money and materials may be obtained without much difficulty all the problems in the efficient running of any project are produced by the men.

Perhaps the most important component of management will be the resource

of a reliable information system. As early as 1971 I had suggested (Planning India's Health, Orient Longman) that morbidity data for the entire country should be obtained on a prospective basis by the evolution and distribution of a standard data sheet drawn up by the statistical bureau of the ICMR.

Other topics on which information will be required are (1) to know the expenditure incurred by different Government, local body and voluntary agencies on health care in the same area (2) the direct expenditure incurred by the families in reaching a private clinic, paying the doctor, paying for transport *etc.* (3) Local problems of disease patterns (4) availability and the reliability of sources for safe drinking water (5) problems of transport of emergencies to referral hospitals (6) the degree of understanding between them and the mini health centres and (7) the extent to which community participation is continuous, deep, sincere and really meaningful.

Strictly, the ideal should be that the planning for health is made and implemented by the community, appreciating the needs and urgency, while the outside, technical persons serve merely as a resource base. But we must accept the truth that the rural, as well as the urban slum, communities are not yet ready to evolve the programmes or even assume their due share of responsibility as participants. For the present and the visible future, therefore, we are concentrating on rural seminars to obtain genuine, consistent and understanding involvement by the consumers of health care : We will be happy if we can achieve this limited target. Lastly comparison between the prevailing models for providing primary health care should be made.

The advantages of a fully manned permanent, Health Centre at 5000 population level are obvious. A Mini Health Centre operates at a cost of Rs. 3·6 only for the Governments, Rs. 1·2 coming from the beneficiaries. This is as against Rs. 16 if one agrees that a Primary Health Centre effectively serves only 20,000 population; Rs. 3·2 if a Primary Health Centre is deemed to serve all the 100,000 population in a block as effectively as a permanent Mini Health Centre which it does not; Rs. 3·8 if a mobile unit is an additional input in the block. The above calculations do not take into account the expenditure incurred by the Rural Development Department in supporting 240 regular dispensaries at a cost of Rs. 50,000 each or Rs. 120 lakhs; 417 rural dispensaries at a cost of Rs. 4,300 each or Rs. 18 lakhs; 3294 family welfare sub-centres at a cost of Rs. 710 each or Rs. 23·4 lakhs. As no information is available on the coverage effected by this expenditure of 1·61 crores, which is unevenly distributed, it is not possible to reckon correctly the percapita expenditure. If the services rendered by the local body units are taken as reaching every citizen in the 374 blocks, it will be an additional input of 43 paise per head per annum. The services are largely symptomatic handling of minor illnesses, no diagnosis attempted, no referral services and no preventive action. Every one of the medical officers in such units, contacted in all the southern states, told me 'I am not concerned with immunisation, nutrition advice, antenatal care or family planning; the responsibility for these vests with the Primary Health Centre

staff'. However the Primary Health Centre is 20 miles away and at the mercy of the vehicle and its driver, both equally temperamental.

In the urban area of Madras City, for example, expenditure on primary health care is incurred by different agencies.

At the moment there are several projects operating in the city of Madras namely (1) the integrated child development scheme (2) scheme sponsored by Social Welfare Board and new resident welfare trust in certain slums (3) MMDA sponsored project in North Madras operated by Swallows (India). These are in addition to the urban family welfare centres, the corporation dispensaries and maternity centres, ESI and CGHS dispensaries and miscellaneous dispensaries run by Catholics, Muslims, Jains, Gujarathis, Sindhis, Ramakrishna Mission, Lion, Rotarians *etc*. The expenditure incurred by all these agencies put together on primary health care must be quite considerable. However, primary health care is really not taken care of in the proper method on accepted academic standards, by most of these agencies.

Health for all by 2000 A.D., on acceptable standards of primary health care, can be achieved in India if the political will and bureaucratic action boldly decide to completely scrap all the numerous, disparate institutions enumerated earlier and replace them all by Mini Health Centres.

In conclusion, 'a resource is efficiently used if the benefit from its use is greater than that which would have been obtained if the same resource has been used in a different manner'. Judged by this logic, we have no doubt that all other models for the delivery of primary health care are inferior to the Mini Health Centre model-rural or urban.

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Indigenous systems of medicine in primary health care

I.S. Gambhir and K.N. Udupa

Integrated Development Programmme
Institute of Medical Sciences, Banaras Hindu University, Varanasi

Indigenous systems of medicine have been in vogue for centuries providing primary health care. It is the people's own health care system and is well accepted by them. Over 80 per cent of our rural population depend primarily and in some cases exclusively, on indigenous systems of medicine for their health care needs. Being an integral part of people's culture, it is not alien to people. In the primary health care, the indigenous medicine systems may be utilized both from the preventive and curative point of view. Amongst them Ayurveda, yoga and naturopathy may be used mostly for preventive and health promotive activities, both of body and mind. For treatment of common ailments Ayurvedic, Siddha, Homeopathy and Unani systems of medicine may be used.

Yoga

Yoga has been widely practised in our country for long, but scientific study of yoga in health promotion is a recent phenomenon. Yoga does not involve any expenditure and may be practised by all groups of people, at all ages. Only proper training and regular practice is required. Yoga practised for promoting physical health is known as *Hath Yoga*. It comprises of various physical postures and breathing excercises (*Pranayam*). Yoga not only increases fitness of body but is also known to delay degenerative changes. It should be instituted at the school and college level and be made an integral part of physical education. Yoga training can also be imparted to adults by the Adult Education Programme to ensure physical fitness.

In modern medicine there are hardly any procedures used for promotion of mental health. In fact, this is a neglected subject, since the people feel that if there is a healthy body, a sound mind will develops. This is not always correct and mind also needs care for promotion of its health. The use of many of the modern psychotropic drugs leads to habit formation, and also have many side-effects. Our own studies and those of others have shown that Yogic practice can be of immense value for the promotion of mental health, and for the prevention of many psychosomatic disorders. Disorders like hypertension bronchial asthma, anxiety neurosis, non-specific chronic colitis, diabetis mellitus, rheumatic

diseases, thyrotoxicosis and others have been successfully treated with various yogic practices alone, or yogic practice with drugs.

Ayurvedic medicine

Ayurveda lays a great stress on the soil where as modern medicine gives greater importance to seed. In Ayurveda, disturbances in the body and mind are said to occur as a result of various internal and external environmental imbalances. Neurohumorals are the basis of the internal milieu which is responsible for health and disease (Cough, *Pitta* and *Bat*). Hence, elimination of the excess of accumulated neurohumors and other tissue products in the body before giving any therapy, is instituted. Once the toxic products are eliminated, then the administration of specific herbal and mineral preparations quickly act on various systems of the body. For treatment, herbs as a whole are used and not their active principles. Since these drugs are natural products, they produce some non-specific action in the body, which ultimately increases the body resistance to overcome the disease.

Ayurvedic medicine may be used in primary health care *viz. Longadi Batti*, for common cold, *Byaghree Haritika* as a cough expectorant, *Palash Beej Churn* for worm infestation, are some of the many examples.

For prevention, Ayurveda lays great stress on dietary routines, seasonal adaptation of diet, sleep and other social activities. Ayurveda supplemented with yoga can effectively serve most of health care needs. We agree with the *Guidelines for integrating traditional medicine into primary health care* as recommended by WHO.

1. Giving recognition to traditional practitioners and incorporating them into community development programmes.

2. Retraining traditional practitioners for appropriate use in primary health care.

3. Acquainting professional health personnal and students of modern medicine with principles of traditional medicine in order to promote dialogues, communication, mutual understanding and eventual integration.

4. Educating the community to believe that provision of traditional remedies is not second rate medicine.

5. Cataloguing medicinal plants in the country.

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The use of scientifically validated herbs and plants in primary health care

Ashok B. Vaidya and D.S. Antarkar*

*CIBA-GEIGY Research Centre and *R.A. Podar Medical College (Ayurvedic) and M.A. Podar Hospital, Bombay*

Halfdan Mahler, Director-General of the World Health Organization has stated, that, ".....There is no doubt that the judicious use of such herbs, flowers and other plants for palliative purposes in primary health care can make a major contribution towards reducing a developing country's drug bill"[1]. What is echoed here is a sentiment expressed by Charaka many centuries back, "The entire world is a preceptor for the wise; the unwise regard it as an adversary". Such an unbiased and receptive attitude coupled with a genuine curiosity are vital for the productive research in traditional remedies.

The diversity, decadence and richness of traditional systems of medicine in India, offer unprecedented opportunities to observe and investigate the current healing practices. Such practices are culturally idiosyncratic and environmentally conditioned by the availability of the herbs and plants. Only a transdisciplinary research approach, directed by an inspired scientific leadership, can generate relevant research data germane to the health technology. Several leading pharmacologists, phytochemists, botanists and Ayurvedic physicians have contributed significantly to research in medicinal plants and herbs. The present authors have also been engaged in such an effort, for more than a decade-and-a-half.

Substantial scientific data do exist about the natural products commonly used in India. It may be expedient to incorporate these drugs in the primary health care.

Ayurvedic pharmacopoeia is a very rich therapeutic inventory. The plants and herbs cited as remedies are around 600, the materials of animal source are 60 and those of mineral source are 80. The total cited formulations are said to be about 23,000. However, the number of formulations, which are in common use, are around 2,000. To confront the reality of scientific investigations of even a fraction of this number, is not an easy task. But prescription-analysis and priority-allocation can assist in the choice of formulations and single plants for research and usage. Formulations have been traditionally used for many centuries and found to be of therapeutic benefit and safe. A priority list of such useful and economical formulations needs to be prepared and the supplies made available

at the level of the primary health care.

Indian pharmacopoeia[3] also contains more than 40 plant or plant products, which are official drugs in India, for diverse clinical indications. The inclusion of these plants and plant products in the Indian pharmacopoeia is based on significant clinical and experimental evidence about their utility. The pharmacopoeial uses appear to be quite limited and restrictive. It is essential to look into the traditional uses of these plants and incorporate such use, which appear valid also, on the basis of pharmacology and phytochemistry. An extensive literature-review combined with field studies on usage may provide interesting data on these plants (Table 1).

The universe of traditional remedies has three sets *viz* ethnobotany, phytochemistry and pharmacology (Fig. 1). The scientific basis of clinical usage of a traditional remedy would depend upon satisfactory data from all these sets. The subset of pharmacology overlapping ethnobotany may provide the most challenging opportunities for clinical research on traditional remedies. An ongoing effort in this area would provide scientific validation or negation of the therapeutic claims.

For the integration of scientifically validated traditional remedies in the primary health care, there should be a phased programme—Phase 1 involving the policy and planning, phase 2 the execution of the programme and phase 3 involving the evaluation of the performance of the programme. Tables II, III and IV show the components of the activities to be conducted during these phases. It would be advisable to give attention to each component and evolve a feasible action-plan. Pilot studies in several regions of India must be conducted for a period of 6 months to obtain feedback for the action plan. Active participation of the community in such a programme is vital for its success. It is essential to get the cooperation of the opinion-leaders, local *vaidyas*, local functionaries and others for the execution of the programme. The programmes for scientific validation of medicinal plants should cover several research components as recommended by a WHO Technical Report[4]. The review of literature and proper identification and nomenclature of plants would require a substantial effort. Besides what is available in Sanskrit, the literature in regional languages has to be carefully scanned and a medicinal plant data bank created. For example, we have collected sizeable data on the use of traditional remedies for the treatment of viral hepatitis, lactation disorders, infertility *etc.* under a project of the 'Ancient Insights and Modern Discoveries' programme of the Bharatiya Vidya Bhavan, Bombay. The priorities in drug plant research, surveys, cultivation and processing of medicinal plants deserve due consideration. Clinical pharmacology of medicinal plants can offer substantial opportunities for research. The efforts in phytochemistry and experimental pharmacology of active ingredients should preferably follow active clinical leads. Information centres for scientifically valid uses of herbs and plants can be set up in all the states of India to collect, analyse and disseminate relevant information on the plants available in those regions. The local news media, television facilities and audio-visual aids

Table I. Some plants in Indian pharmacopoeia

Sanskrit common name	Botanical name	Pharmacopoeial use
Visha	*Aconitum napellus*	Analgesic, cardiac depressant
Yavani	*Carum copticum*	Carminative
Ghrita-Kumari	*Aloes barbadensis*	Purgative
Suvarnaka	*Cassia fistula*	Laxative
Vasaka	*Adhatoda vasica*	Expectorant
Ashvagandha	*Withania somnifera*	Sedative
Ashoka	*Saraca indica*	Uterine tonic
Bilva	*Aegle marmelos*	Astringent, digestive
Vakuchi	*Psoralea corylifolia*	Pigment inducing
Punarnava	*Boerhavvia diffusa*	Diuretic
Madhurika	*Foeniculum vulgare*	Carminative
Ganjika (Bhang)	*Cannabis indica*	Sedative
Katuvira	*Capsicum annuum*	Carminative
Ela	*Elettaria cardamomum*	Carminative
Thwak/Dalchini	*Cinnamonum cassia*	Carminative
Eranda	*Ricinus communis*	Laxative
Chaulmoogra	*Hydnocarpus kurzii*	Antileprotic
Kiratatikta	*Swertia chirata*	Bitter and tonic
Lavanga	*Eugenia carophyllus*	Carminative
Dhanyaka	*Coriandrum sativum*	Carminative
Dhustura	*Datura metel*	Parasympatholytic
—	*Ephedra gerardiana*	Sympathomimetic
Srangavera	*Zingiber officinale*	Carminative
Gvar gum	*Cyamposis tetragonotobus*	Excipient
Isapgol	*Plantago ovata*	Demulcent
Jatiphalam	*Myristica fragrans*	Flavouring agent
Jatamonsi	*Nardostachys jatamansi*	Sedative
Mahatikta Kalamegha	*Andrographis paniculata*	Bitter
Kutaja	*Holarrhena antidysenterica*	Antiprotozoal
Uma	*Linum usitatissiimum*	Protective
Yashtimadhu	*Glycyrrhiza glabra*	Demulcent
Katuki	*Picrorrhiza kurrooa*	Bitter
Haritaki	*Terminalia chebula*	Astringent
Nimba	*Azadirachta indica*	Local application
Vishamushti	*Strychus nux vomica*	Bitter
Khulinjan	*Alpinia officinarum*	Antirheumatic
Sarpagandha	*Rauwolfia serpentina*	Hypotensive
Amlavetasa	*Rheum emodi*	Purgative
Kushta	*Saussurea lappa*	Expectorant
Haridra	*Curcuma longa*	Colouring agent
Vana-Palandam	*Urginea indica*	Cardiotonic
Vidanga	*Embelia ribes*	Anthelmintic

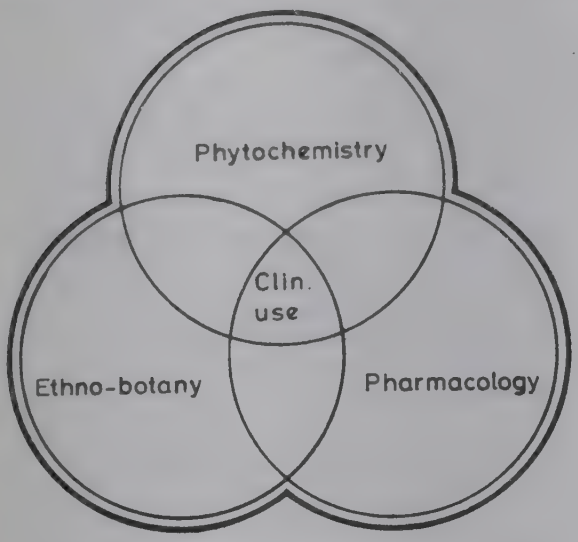

Fig. 1. Universe of traditional remedies.

can be utilized for dissemination of information.

We have been conducting[5] clinical research on traditional remedies for the last decade-and-a-half. There have been several interesting findings, which can enhance the validity of the use of herbs and plants in the primary health care.

The therapeutic effect of the powder of seeds of *Mucuna pruriens* (*Atmagupta*) was studied in 23 patients with Parkinson's disease, employing the Northwestern University Disability Scale[6]. The powder was well tolerated and accepted by the majority of patients. The overall morbidity score dropped from $32{\cdot}30 \pm 3{\cdot}35$ to $17{\cdot}04 \pm 3{\cdot}12$ ($P < 0{\cdot}01$). L-dopa was absorbed well from the seed powder, as shown in Fig. 2 representing the plasma curve of l-dopa, estimated fluorometrically[7]. The side effects of *M. pruriens* were mild and transient[8]. The plant was also observed[9] to decrease the chloropromazine-induced rise in prolactin in psychiatric patients. *Mucuna pruriens*, which grows widely all over India, can provide an economical treatment for patients with Parkinson's disease.

We have also been interested in the scientific assessment of Ayurvedic therapy for viral hepatitis[10]. We have evaluated

Table II. Phase 1 : policy and planning

1. Mission statement
2. Acceptance of the policy and goals
3. Information retrieval and storage :
   - (*a*) Health situation
   - (*b*) Inventory of health personnel
   - (*c*) Formulary of traditional remedies
4. Definitive action plan
   - (*a*) Mode of integration
   - (*b*) Educational programmes
   - (*c*) Farms and pharmacies for plants
   - (*d*) Quality control methods

Table III. Phase 2 : programme execution

1. Preparatory activities :
   - (*a*) Training of personnel
   - (*b*) Preparation of service facilities
   - (*c*) Community orientation
2. Therapeutic use of traditional remedies :
   - (*a*) Minimal records
   - (*b*) Response rates
   - (*c*) Tolerability data
3. Followup :
   - (*a*) With personnel
   - (*b*) In the community

Table IV. Phase 3 : performance evaluation

1. Change in health situation
2. Acceptability by the community
3. New awareness about traditional remedies
4. Feedback to research

Table V. Common Ayurvedic remedies for some diseases

Disease	Traditional remedies
1. Common cold	Tribhuvankirtirasa, Sudarshanghanvati
2. Sore throat and cough	Sitopaladichoorna, Khadiradivati, Vasarasa
3. Diarrhoea	Jatiphaladivati, Kapitthashtak choorna
4. Amoebic dysentery	Kutajaghanvati, Belphaladichoorna
5. Intestinal helmin thiasis	Yayanyadichoorna, Krimikutharasa
6. Iron-deficiency anaemia	Punarnavadimandoor, Suvarnamakshikbhasma
7. Urinary infections	Chandanadivati, Gokshuradiguggul, chandraprabha
8. Hyperacidity-ulcer	Avipattikarchoorna, Sootshekharrasa, Pravalphasma
9. Indigestion	Hingvashtakchoorna, Shankhvati, Papaya
10. Constipation	Triphala, Swadishta Madhuvirechana, Senna
11. Menorrhagia	Ashokarishta, Nagkesar, Lajwanti
12. Insomnia	Pippalimoola, Saraswatarishta
13. Eye infections	Rasanjan, Nirmali, Hemakshirighana
14. Ear infections	Garlic/Onion juice, Apamargksharataila, Vishagarbhataila
15. Dermatomycosis	Chakramarda, Dadrughnasogathi, Manjishthadi kwath
16. Scabies	Neem oil, Gandhakadivmalham
17. Rheumatic pains	Yogarajgugulu, Rasnadikwath, Narayantaila
18. Malaria	Sudarshanghanvati, Saptaparnaghanvati, Sanshamanivati
19. General weakness	Chyavanprash, Ashwagandharishta
20. Hypertension	Sarpagandhaghanvati, Punarnavadi kwath
21. Fluid retention	Punarnavadi kwath, Neem, Triphala
22. Liver dysfunction	Arogyawardhani, Kumaryasava, Daruharidra
23. Chronic sinusitis	Shadbindutaila, Kataphaladi choorna
24. Chronic colitis	Panchamritparpati, Lavanabhaskarchoorna
25. Urticaria (allergy)	Haridrakhanda, Ajavayan
26. Eczema	Manjishthadi kwath and Malham, Paradadi malham
27. Aging	Brahmirasayam, Palash, Rasayanachoorna

the following drugs in phase 2 studies : *Arogyawardhani*, *Punarnavadi kwath*, *Trikatu* and *Luffa echinata*[11]. *Ricinus communis* has been studied by Joshi *et al* (Personal communication) whereas *Picrorrhiza kurrooa* has been studied by Pandey and Chaturvedi[12].

Arogyawardhani, 500 mg given po three times in a day, with *Punarnavadi kwath* administered orally 30 ml, twice in a day, showed significant reduction in serum bilirubin from $5{\cdot}2 \pm 0{\cdot}41$ to $2{\cdot}2 \pm 0{\cdot}41$ within one week ($P < 0{\cdot}001$). Serum transaminases were also reduced

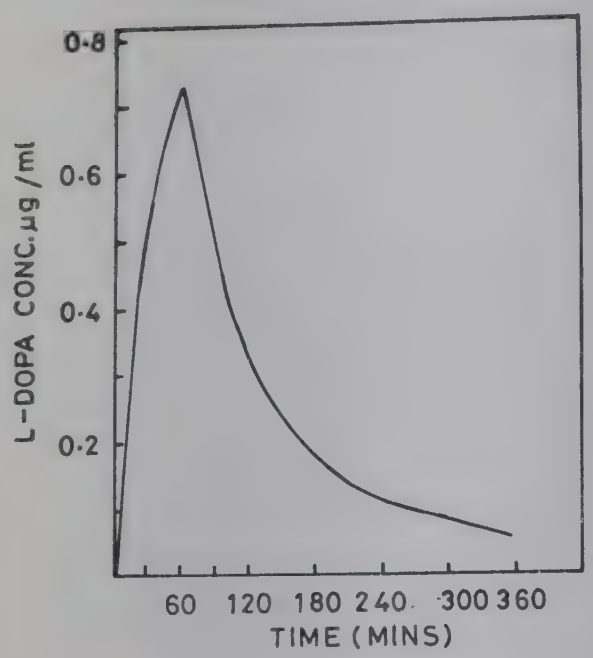

Fig. 2. The curve of mean plasma level of L-dopa in nine patients after 10 g per oral of *M. pruriens*.

significantly[13]. Subsequently, a double-blind trial of *Arogyawardhani*, was carried out[14]. As compared to placebo, *Arogyawardhani* showed a significant decrease in total and direct serum bilirubin, within 4 days of therapy. *Arogyawardhani* is a widely used drug in Ayurveda. It can be easily adopted in the primary health care for the treatment of viral hepatitis.

For many years, we have been actively engaged in conducting clinical trials with plants and herbs claimed to possess hypoglycaemic activity. We have screened around 20 plants with placebo controls. *Saptarangi* (*Salacia prenoides* ? or *Caesaria esculenta* ?) claimed to have a hypoglycaemic properly, was not found to reduce blood sugar in our placebo-comparisons in diabetic patients. Similarly, *E. jambolana* was not observed to possess any significant hypoglycaemic activity.

Rubia cordifolia (Manjistha) is commonly used in Ayurveda for diverse skin conditions. In a study in collaboration with Bhatt and Shroff, we observed that *R. cordifolia* has a significant therapeutic effect in eczema. It was also observed to have anti-inflammatory activity in rats with carrageenan oedema. This plant can be used in the treatment of eczema. More basic research needs to be carried out on its action.

Liquorice or *Glycerrhiza glabra* (Mulathi) is a commonly used plant in Ayurveda. Certain active constituents of this plant, like glyrrhetinic acid are known to possess corticosteroid like activity. Carbenoloxone, a drug chemically related, has been recommended for the treatment of peptic ulcer[15]. This compound is known to increase the gastric epithelial life-span, alter mucus secretion, decrease back-diffusion of hydrogen ions in gastric mucosa, inhibit peptic activity and also possess an anti-inflammatory activity. Liquorice extract can be commonly employed for diverse indications in primary health care, as an anti-inflammatory agent.

Berberis aristata (*Daruharidra*) and *Argemone mexicana* (*Swarnakshari*) have been commonly used in Ayurveda for the treatment of eye infections. Antibacterial properties of berberine, an active principle of these plants have been studied by several workers[16,17]. Berberine has also been reported to form a complex with DNA[18]. The use of the extract of *B. aristata* in common eye infections tends to be scientifically validated by the aforesaid observations.

Table 5 shows the common Ayurvedic drugs used for some diseases in India. It is desirable to conduct field surveys of Ayurvedic drug usage for common diseases. The patterns of drugs may

vary in different parts of India. It is also essential to have some data about the relative efficacy and tolerability of commonly used drugs. The persistent trend for massive polypharmacy in Ayurveda may then be reversed with the use of less number of effective drugs.

With the modern diagnostic sophistication it is essential that clinical pharmacology of traditional drugs is applied for specific disease entities. A rigorous scientific investigative endeavour may weed out ineffective, weak or unsafe plants and herbs and may also provide new therapeutic leads which may develop into major breakthrough *e.g.* Rauwolfia serpentina. It is essential that WHO, ICMR, CSIR, industrial and university research laboratories embark upon a meaningful and productive programme of scientific research on traditionally used plants and herbs.

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Appropriate Technology for Primary Health Care, 1981 pp 87-95

Vector control operations in rural areas and community participation

P.K. Rajagopalan

Vector Control Research Centre, Pondicherry

Malaria, viral encephalitides and filariasis (transmitted by mosquitoes), scabies (transmitted by the tropical itchmite, *Sarcoptes scabiei*), and several gastro-intestinal infections (mechanically transmitted by houseflies) are the major vector transmitted diseases in the rural areas. In many areas kala azar (transmitted by sandflies) was also common. However, until malaria control was achieved in early sixties, malaria virtually overshadowed the importance of other diseases, except probably during epidemics of severe gastro-enteritis.

Even before the advent of DDT, actual malaria control was achieved by environmental manipulation and larval control in several places, notably in Assam tea plantations, big cities like Bombay and Delhi and in some project areas[1]. But there was virtually no organized control programme in rural areas with 82 per cent of the Indian population and where malaria was a major health problem until pyrethrum came as an insecticide in the year 1935[2]. Effective malaria control was achieved in some rural areas with pyrethrum[3-8]. However, the method was uneconomical and frequent spraying, and in some instances daily, was required[9]. Thus due to high cost and other practical difficulties, malaria control measures were not extended to all the rural areas until such a time an economical method was evolved with the availability of DDT[10]. When the National Malaria Control Programme was started in 1952, there were 75 million positive cases, and the case incidence was brought down to 100,000 by 1965. Malaria staged a gradual come back since then and there were 4·14 million cases in 1978[11]. Because of our preoccupation with malaria, control of other diseases like filariasis received virtually no attention, though kala azar was controlled as a result of collateral benefit from DDT sprays.

Before the DDT era, larval control by the use of larvivorous fish and Paris Green, in addition to removal of vegetation from breeding places, levelling and filling of ditches and pits *etc.*, formed the main plank of vector control operations. In fact, by removing marginal vegetation in flowing channels and streams, the vector mosquito *Anopheles fluviatilis* was virtually eradicated for some time in North Kanra District of Karnataka State[12]. Innumerable ponds in Kerala are deliberately stocked with vegetation—a condition conducive to the perpetuation of vectors of malayan filariasis. By simple manual removal of vegetation,

Brugia malayi infection was controlled[13]. But there has been strong objection to the removal of vegetation by the people[14]. While these methods are effective, they were put under the carpet in the DDT era. With the failure of insecticidal control of vectors and the resurgence of malaria, the reasons for which are too well known to be enumerated here, interest is now reviving on older methods of environmental and naturalistic control. The virtual non-availability of newer insecticides, high cost of them and the awareness of environmental pollution have only emphasized the need for such an approach.

A feasibility study on vector control without using any chemical pesticides is being carried out by the Vector Control Research Centre (VCRC) in eight coastal villages of Pondicherry covering a population of 10,000. The accent is on environmental and naturalistic methods of control with community participation. Most of the inhabitants are fishermen. Malaria cases have been reported every year, and small numbers of microfilaria carriers have also been recorded in these villages[15]. Scabies is very common among children and the commonest ailments reported at the Primary Health Centres are scabies and gastro-enteritis. Houseflies and bedbug nuisance are common. An extensive survey was carried out on the mosquitoes prevalent in the area and their breeding habitats (Table 1). The different habitats are casuarina pits, wells, containers, pools of rain water and small drains. There are also paddy fields and backwaters. No control measures were attempted in paddy fields since a variety of insecticides are already being used in agricultural practices and no environmental control method is practicable. The villages are surrounded by casuarina plantations, to water which, numerous pits are dug which get filled with subsoil water or rain water. The number of pits vary in different seasons, depending on how many new pits are dug. These pits are major mosquito breeding habitats. There is a domestic coir industry where coconut husks are soaked in earthenware pots for months and also ground pits. These breed mosquitoes prolifically. The wells also breed mosquitoes though the intensity is low and seasonal. The pools and drains are of a transient nature. There is a large area of back waters where breeding takes place near the embankment or in pits dug for earth worms.

What is attempted in the rural areas is 'environmental modification' involving some form of physical transformation aimed at preventing, eliminating or reducing the larval habitats of vectors—*i.e.*, drainage, filling, land levelling and transformation of impounded margins as emphasized by the WHO[16]. Since the source of water for watering casuarina plants cannot be stopped, as it will adversely affect the economy of the people, fish have been introduced into casuarina pits. No other method of vector control is practicable in such habitats. While the incidence of malaria is not high in the coastal villages under study, in another area (Rameswaram island) heavy mosquito breeding in similar habitats contributes to persistent epidemics of malaria every year. The present study by VCRC will indicate the appropriate technology for use in such areas.

The main strategy for mosquito control was to use larvivorous fishes

Table I. Mosquito species breeding in different habitats in Pondicherry villages

Mosquito species	Paddy fields	Wells	Casurina pits	Backwaters	Drains	Streams	Containers	Pools and ponds
*Anopheles subpictus***	+	+	+	+	+	+		+
A. vagus	+	+	+	+	+	+		+
*A. varuna**		+						
A. peditaeniatus	+							
A. nigerrimus	+							
A. barbirostris	+							
A. pallidus	+							
A. Jamesi			+					
*A. culicifacies**						+		
*Aedes aegypti**							+	
Armigeres subalbatus							+	
*Culex quinquefasciatus**		+			+		+	+
*C. vishnui group**	+	+	+					+
C. sitiens				+				
*C. bitaeniorhynchus***	+							
*C. whitmorei***	+							
*C. gelidus***	+	+						
C. fuscocephala		+						
C. pallidothorax		+					+	
C. minutissimus		+						
*Mansonia annulifera**								+
*M. uniformis**								+

*Vectors; **Suspected vectors

in casuarina pits and wells. These habitats are checked every week, and wherever fishes are absent, they are reintroduced. Pits which are dry in some months, get filled with water after rains where fishes are introduced. In many pits and wells, presence of algal growth and floating vegetation prevented effective predation by fishes and in such cases the algae and floating debris are removed. Fishes do not get acclimatized quickly in all these habitats and it takes repeated introduction. In most of the pits and wells, fishes have established themselves and were found breeding. Such of these pits and wells were found negative for mosquito breeding (Figs 1-3). Regarding containers, in the beginning emptying water from the containers once a week was attempted. To refill the pots, the villagers had to bring water from long distances. The current strategy is to cover the mouth of all these pots with nylon mosquito netting which has yielded good results (Figs. 4,5). The main emphasis in our strategy is not to interfere with the economy of the villagers—otherwise closing the pits and destroying of the pots would have been easy solutions but the programme would have faced opposition from the villagers. Though fishes are already present in backwaters, effective predation is prevented by the presence of sheets of algal growth, which were periodically removed. But no effective vector control could be achieved because of the vastness of the area. The small earthworm pits (earthworm is used as fish bait) which breed mosquitoes were closed, but new ones come up very fast. In the initial stages, the VCRC demonstrated waste disposal to reduce housefly

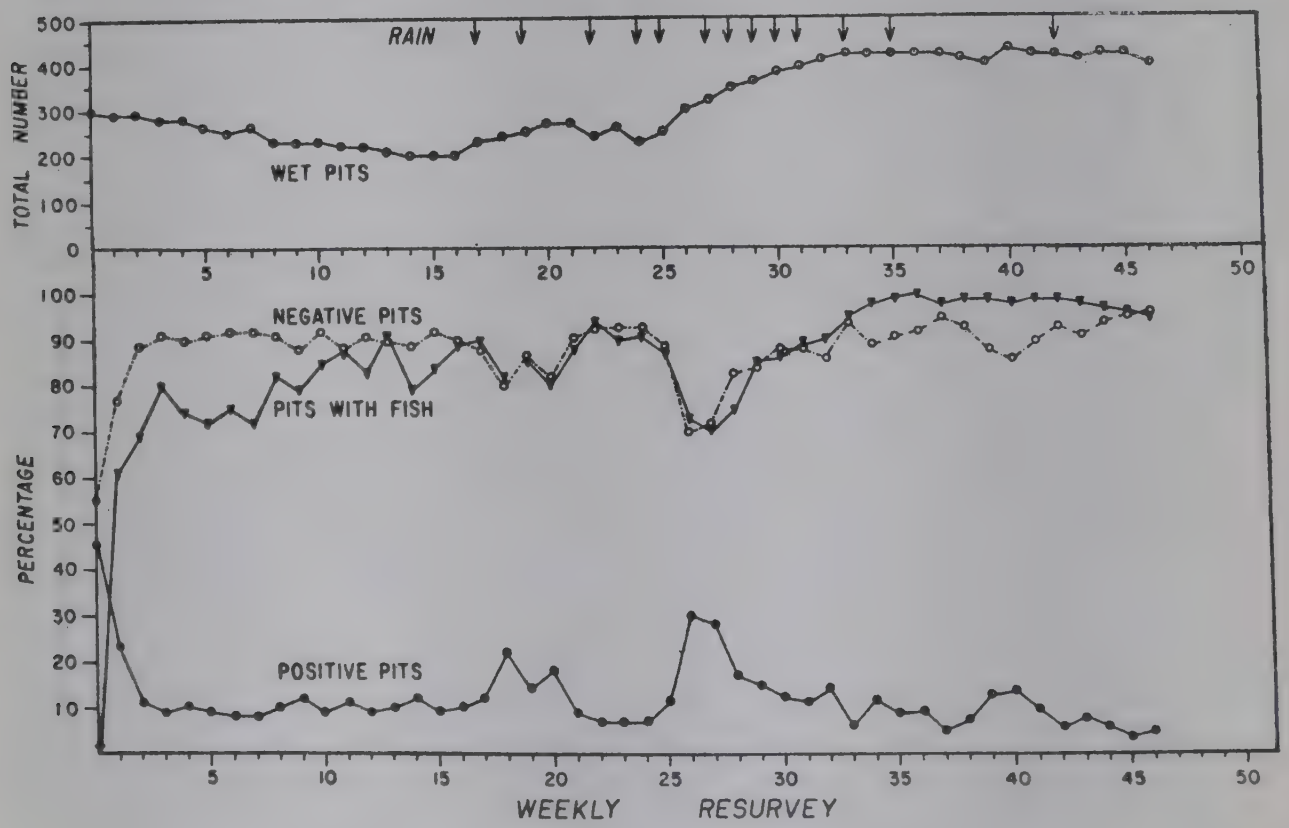

Fig. 1. Control of breeding in casuarina pits by use of fish.

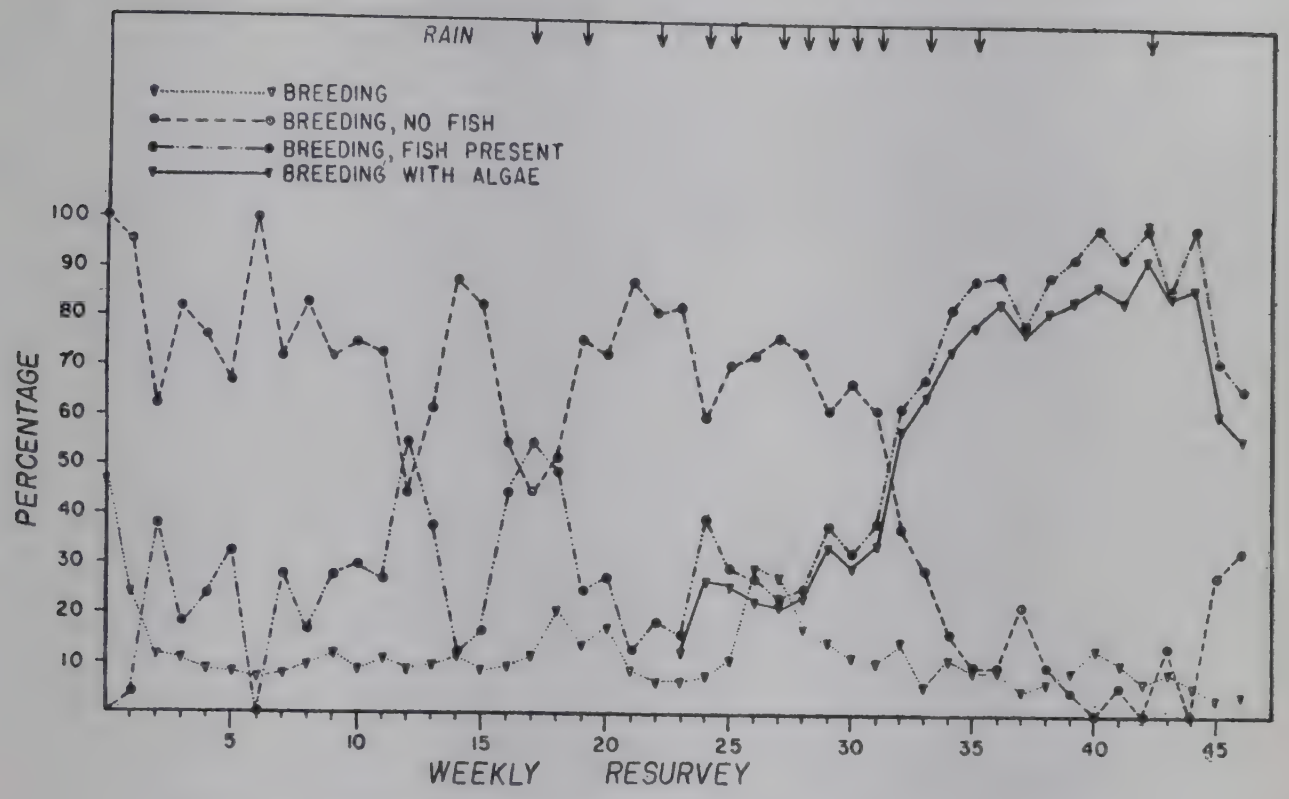

Fig. 2. Inhibition of predation of mosquito larvae by fish in casuarina pits.

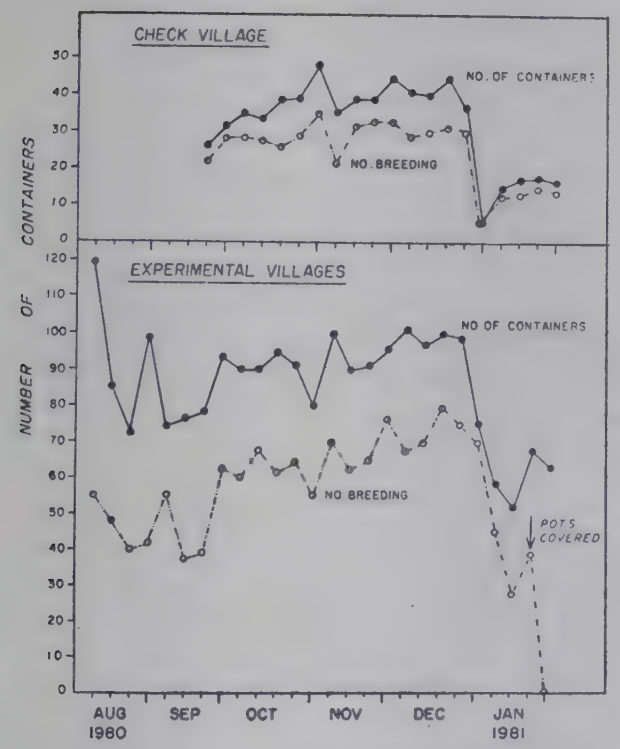

Fig. 3. Control of mosquito breeding in containers (northern villages).

breeding. Mounts of garbage piled up over decades were removed and buried.

Community participation

No vector control programme will succeed on a long term basis if there is no participation of the community. The difficulties encountered in the malaria control programmes, *viz.*, refusals to spraying, whitewashing or cowdung smearing of the walls immediately after spraying ***etc.*** are well known examples. It has been observed[10] that people are appreciative of the danger as long as prevalence of the disease is high or there are large numbers of deaths during epidemics. But the position is soon changed once the epidemic is over. The VCRC went in right earnest to enlist community participation, and these efforts are still continuing.

To gain the confidence of the people, the VCRC organized meetings, held individual and group discussions, and the danger of vector transmitted diseases

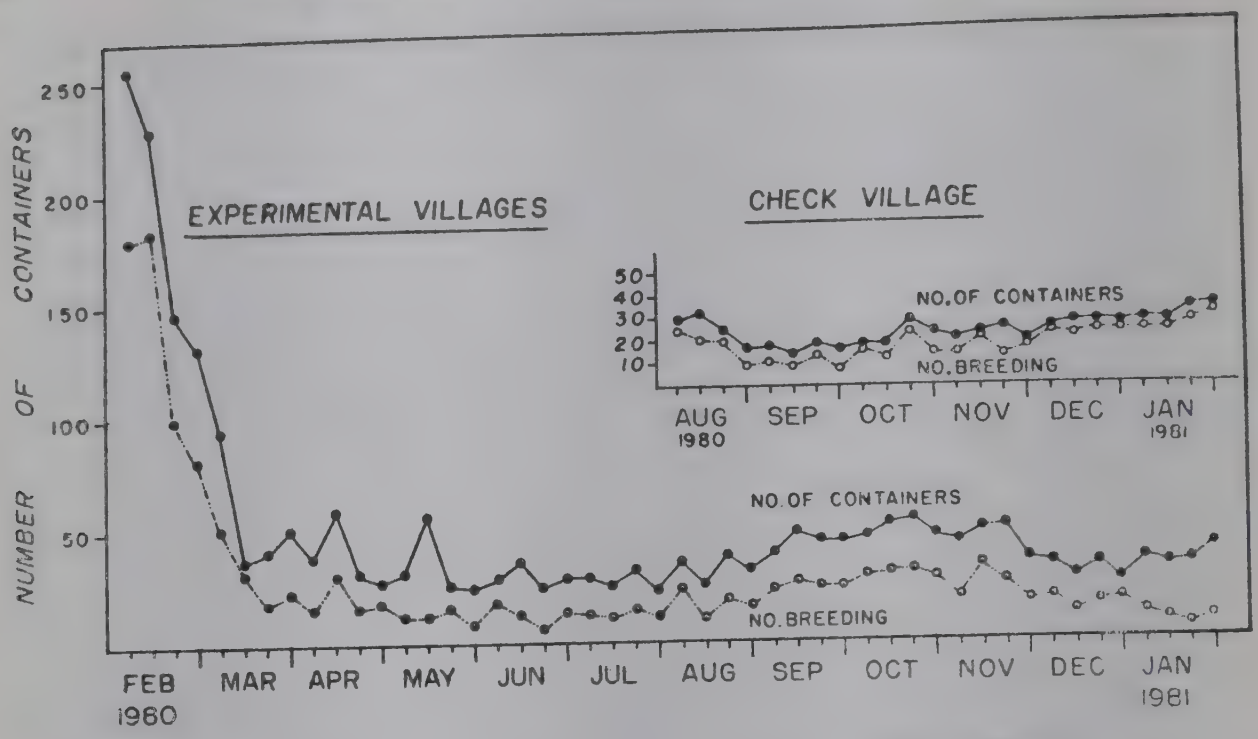

Fig. 4. Control of mosquito breeding in containers (southern villages).

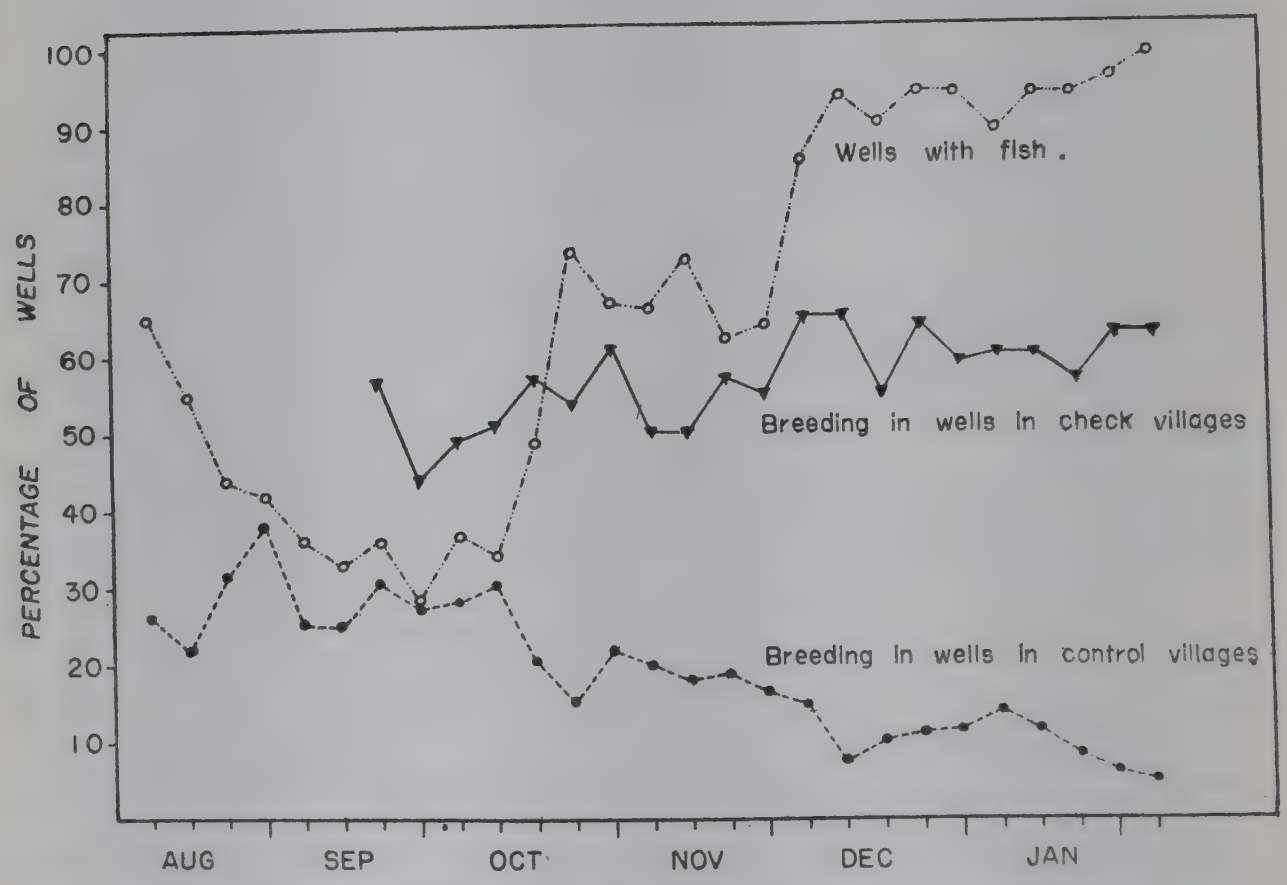

Fig. 5. Weekly survey for mosquito breeding in wells (No. of wells in control area = 191; check area = 44).

was explained to them. Health films were also screened. A sustained campaign was kept up by four social workers for a population of 10,000 in 8 villages. The VCRC cleaned the wells, removed mounts of garbage accumulated over the years, distributed milk powder provided by the Health Department, supplied soaps *etc*. The VCRC took up the grievances of the villagers, like fitting bulbs to street lights, procuring drinking water supply and in one village even for laying a road, with the Government of Pondicherry. House to house visits by a doctor once a week was arranged. Defunct youth clubs and Women's organizations were activated and new ones formed and benefits from the Government were obtained for them. This process went on for six months and the people very much appreciated the efforts, but none would come forward to volunteer for vector control work. The VCRC was conscious of the fact that the initial enthusiasm generated should not wane with the passage of time and therefore a continuous campaign was kept up inspite of lack of any enthusiasm among the villagers. But unfortunately, community participation in vector control programmes did not even get started. The reasons were later investigated and analysed.

There are a multiplicity of agencies like Block Development Organization, Social Welfare Department, Project Extension Office, Fisheries cooperatievs, Cooperative bank, *etc*., all trying to 'Serve the people and improve their lot'. Large sums of money are spent every year. Most of the benefits are cornered by a few people with the active connivance of some of the officials. A majority of the people does not get any benefit and therefore openly express lack of faith in any Governmental programme. Group rivalries are common and each village has atleast two or three groups. A murder in one of the villages still remain uninvestigated. In group fights, the poorer sections get the raw end also from the police. All the so called welfare measures have only widened the gap between the affluent few and the poor majority. Casteism, though abolished by law, is very much there, the upper and lower castes living in separate areas within the same village. The majority of the people are poor, their income depending on a good fish catch, which is seasonal. They lead a life of perpetual indebtedness to a few village leaders who lend money and whose directions they follow. In one of the villages, there was violent protest from the Panchayat leaders about formation of youth clubs since they were afraid of losing control on the youth ! There is absolutely no motivation. Community participation will be there if they are either educated (which they are not), if it is economically beneficial (which it is not since the impact of vector control cannot be assessed in terms of cash benefits) or if they improve their social status (which also does not happen). Health care delivery is an abstract thing and unlike construction of a bridge or building, is never perceptible. Under these circumstances, health education makes the least impact. At least, in health care delivery systems, people get some medicines and their ailments are cured. In vector control operations, the results are obscure and cannot be projected.

In such conditions, the participation of the community is not forthcoming.

They are too poor to concern themselves with sanitation or mosquito nuisance !. Health cannot be viewed in isolation and health care, including vector control, must be delivered in a package programme along with other benefits of a socioeconomic nature.

Cost of vector control operations

Vector control operations should be carried out at a cost not exceeding what the communities concerned can afford to allocate for such a purpose. Within that context, it is usually appropriate to favour long term measures like environmental improvement, where though the initial costs are higher, recurrent expenditure will be low. Use of fish to control mosquito breeding with minor engineering works was in practice in the pre DDT era and various estimates of the expenditure incurred are given[17]. The percapita expenditure for vector control ranged from Rs. 0·12 to Rs. 6.00 in different years in the pre DDT era. Recently, it has been advocated[18] that a permanent reduction in malaria incidence could be obtained if a sum of Rs. 10,000 per an average village of 1000 persons spread over a period of three years, is spent on environmental improvement (Table II).

The VCRC operations in the 8 coastal villages covering a population of 10,000 costs on an average Rs. 9·70, if overheads are included, and Rs. 2·75, if only

Table II. Cost of vector control operations (per head/year)

Estimated by	Population size	Type of operation	Cost per head, Rs
Pre DDT era :			
Sweet and Rao 1934	500—2000	Larvicidal control	2·00 to 6·00[17]
	2000—5000	Larvicidal contral	0·75 to 1·50[17]
	5000—10,000	Larvicidal control	0·40 to 1·00[17]
Covell and Afridi 1939	Delhi area	Larvicidal control	0·12[17]
Viswanathan 1946	Haliyal (Karnataka)	Larvicidal control	0·50[17]
Post DDT era :			
8 villages 25 sq. kms (VCRC)	10,000	Larval control Environmental management	
		Overheads	9·70*
		Operational only	2·75*
		Insecticides only	2·25*
Pondicherry urban 60 sq. km (VCRC)	2·2 lakhs	Insecticides only	2·25*
Hypothetical estimates	For average village of 1000 population for entire country	Environmental control	3·30[18]

*VCRC work

operational costs are included, per head per year. If insecticides are to be used in these villages, it would cost Rs. 2·25 per head per year, but this would still leave many habitats like wells *etc.*, without any control. The average population size of a village in Pondicherry varies between 2000 to 3000 and therefore environmental control of vectors would cost about Rs. 5000 to 8000 per village per year. The cost may be lower in interior villages where the breeding habitats are different or smaller in surface area, than in the coastal villages under study.

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Appropriate technology for tuberculosis control—chemotherapeutic regimens

S.P. Tripathy

Tuberculosis Research Centre, Madras

Tuberculosis is a major public health problem in India with high morbidity and mortality. In the earlier years it was believed that tuberculosis was largely a problem of the urban areas. The National Tuberculosis Sample Survey conducted by the Indian Council of Medical Research during 1955-57 clearly showed that contrary to this earlier belief tuberculosis was as prevalent in the rural areas as in the congested towns and cities. Today, there are approximately 8 million cases of pulmonary tuberculosis in India. Of these, only about 1·5 million are residing in about 3000 towns and cities, while the remaining 6·5 million live in approximately 600,000 villages many of which have practically no health care facility in the vicinity. If the tuberculosis control measures are to have any impact in the country, it is necessary that the control measures be directed towards the detection and treatment of tuberculosis cases in the rural areas. The challenge of case finding and treatment in the vast rural areas where conventional methods such as mass X-ray and sanatorium treatment would call for tremendous resources in terms of men, money and material, is almost impossible for a developing country like ours. In order to evolve control measures which are feasible it is essential that we adopt appropriate technology which can be applied on a mass scale. The Tuberculosis Research Centre (formerly called Tuberculosis Chemotherapy Centre) in Madras and the National Tuberculosis Institute in Bangalore have played key roles in the development of appropriate technology for tuberculosis control in India. Indeed, the findings of the studies in these two institutions have helped most countries to develop appropriate technology for tuberculosis control.

The classical Home and Sanatorium Study of the Tuberculosis Research Centre reported in 1958, followed by other similar studies, clearly demonstrated that domiciliary treatment of tuberculous patients on an ambulatory basis is as effective as treatment of the patients in the Sanatorium. The advent of specific antituberculosis drugs lowered the traditional importance of factors such as nutritious diet, isolation, bed-rest, *etc* available to patients admitted to sanatoria. It was clear that the most important factors which influenced the outcome of treatment were the chemotherapy given to the patient, and having his treatment regularly and without interruption for the scheduled duration. The severity of disease,

manifested as the radiographic extent of disease, the presence of cavitation and the degree of sputum smear positivity, was of some prognostic importance. However even severe cases of pulmonary tuberculosis can be effectively treated on a domiciliary basis with suitable combinations of antituberculosis drugs. Domiciliary treatment is thus the appropriate technology for tuberculosis control.

Of the 8 million cases of pulmonary tuberculosis prevalent in India, about 2 million are infectious cases with positive sputa. These are the cases which are of public health importance, as they are responsible for spreading the disease in the community. Most of these cases are already attending the general dispensaries and health services with symptoms such as cough, fever and haemoptysis. It is necessary that they be dealt with first, on a priority basis, and this is best achieved by integrating the diagnosis and treatment of tuberculosis with the general health services at all levels, so that the majority of the symptomatic infectious tuberculosis patients who are already attending at the general health services are diagnosed through sputum microscopy and offered treatment facilities. Domiciliary treatment offered from dispensaries near the patients' homes is thus appropriate technology for tuberculosis control and promotes good regularity in treatment.

Today, we have in our armamentarium several antituberculosis drugs, including isoniazid (H), rifampicin (R), streptomycin (S), ethambutol (E), thiacetazone (T), *p*-amino salicylic acid (PAS), ethionamide (Eth) and pyrazinamide (Z). Isoniazid is the most potent antituberculosis drug, inexpensive and with low toxicity. This drug must be given to any patient who is diagnosed as having tuberculosis. Appropriate technology lies in the formulation of chemotherapeutic regimens which combine isoniazid with at least one other drug. It is tempting to recommend a combination of isoniazid with the second most potent drug, rifampicin. This, however, would not be appropriate technology for a developing country like ours. Rifampicin is the most expensive antituberculosis drug, a day's treatment costing as much as 5-7 rupees. Most of the tuberculosis patients are poor and have to be given drugs free of cost. To employ a daily regimen of rifampicin plus isoniazid on a mass scale would be impossible. Combining isoniazid with the inexpensive drug, thiacetazone, would be appropriate for tuberculosis control for countries like India. This combination is the first regimen of choice recommended for application in the national tuberculosis programme. If thiacetazone is not tolerated by a patient, it can be replaced by PAS. The latter drug, however, is bulky, unpalatable, and of late, has become expensive. There is therefore now a tendency on the part of many practitioners to avoid the prescription of PAS, and instead employ a regimen of isoniazid plus ethambutol.

Table 1 summarises the results of several controlled clinical trials carried out at the Tuberculosis Research Centre with conventional chemotherapeutic regimens requiring self-administration of drugs daily for a period of one year. The patients were all having bacteriologically positive pulmonary tuberculosis at the time of starting their treatment and were treated on an ambulatory basis. Their progress was followed up by monthly

Table I. Efficacy of unsupervised daily regimens

Regimen	Total patients	Favourable response at 1 year (%)
Isoniazid alone in 2 doses daily	129	45
Isoniazid alone in a single dose daily	207	70
Isoniazid + thiacetazone	72	82
Isoniazid + PAS	454	85
Isoniazid + ethambutol	107	96

sputum examination, and they were classified as having had a favourable response if all the sputum specimens collected during the last 3 months (10, 11 and 12) were culture negative.

The regimens are all oral regimens, require no injections and hence can be applied in rural areas. The best regimen of isoniazid alone has an efficacy of only 70 per cent—the remaining 30 per cent fail, with emergence of acquired isoniazid—resistance and with a possibility of spreading the resistant strains in the community. Treatment with isoniazid alone is therefore not recommended.

The three 2-drug combinations are substantially more effective, with efficacies ranging from 82—96 per cent, and can be employed in the tuberculosis control programme. In rural areas where injection facilities can be provided, the two-drug oral regimens can be supplemented with an initial phase of streptomycin daily for about 2 months, in which case the efficacy is boosted up to near 100 per cent in patients who have been infected with drug-sensitive organisms.

There are, however, some difficulties in obtaining such spectacular results in field practice. Among causes which contribute to the failure of chemotherapy, inadequate patient compliance ranks very high. The protracted course of chemotherapy requiring drugs to be taken over one year or longer tells upon the patience of the patient. Many patients discharge themselves from treatment prematurely. Further, there is a substantial degree of concealed drug–irregularity. Patients continue to collect drugs from the dispensaries but stop taking the drugs or are irregular in taking them. Because of drug –irregularity, results of chemotherapy under field conditions rarely match those achieved in clinical trials; there is often a gap of 30 per cent or more between the efficacies under trial and field conditions. It is therefore necessary to eliminate these causes of failure of chemotherapy under programme conditions.

There are two ways of ensuring a full course of chemotherapy. Firstly, shortening the duration of chemotherapy from the conventional 12 months, to say,

6 months, will go a long way towards ensuring patient compliance. Secondly, giving drugs under full supervision would eliminate *concealed* drug-irregularity altogether. The administration of all doses of drugs under full supervision in the clinic has been made practicable by evolving intermittent regimens that need drug-administration only twice a week. The patient attends the clinic twice a week, receives his medication on those days under full supervision by the clinic staff and goes home. He does not require any medication on the remaining 5 days of the week. The intermittent regimens have several advantages over daily regimens—(*a*) Adverse reactions to drugs are less frequent with intermittent regimens than when drugs are administered daily, (*b*) the regimens are entirely supervisable so that concealed drug irregularity is impossible, (*c*) they are at least as effective as the daily regimens and (*d*) they are often less expensive.

The intermittent regimen of streptomycin plus isoniazid twice a week has a very high efficacy of over 90 per cent as shown in studies in Madras, Czechoslovakia and Singapore. This regimen can be effectively employed in those rural areas where injection facilities can be provided. In areas where injection facilities are not available, a fully oral regimen of PAS plus isoniazid twice a week can be prescribed; this regimen was found to have an efficacy of 88 per cent in a controlled clinical trial in Madras, and was at least as effective as the daily regimen of PAS plus isoniazid.

Regarding shortening the duration of chemotherapy, there have been many promising reports of short-course regimens of 5-9 months duration, with varying levels of efficacy. All these regimens employ isoniazid in combination with rifampicin, pyrazinamide and streptomycin. Rifampicin is the most expensive antituberculosis drug today and regimens requiring its administration daily for periods of 6 to 9 months cannot be employed on a mass scale. Studies are under progress to evolve effective short course regimens which do not require rifampicin, or require the drug to be given intermittently and/or for a short period only, so that the total cost of the chemotherapeutic regimen is brought down to make its application on a mass scale possible. Until we have such relatively inexpensive short-course regimens, chemotherapeutic regimens of standard duration, and employing the conventional drugs such as isoniazid, streptomycin, thiacetazone, PAS and ethambutol, constitute appropriate technology for tuberculosis control. These drugs can be employed in appropriate combinations to make the regimens highly effective. Drug resistance does not pose a serious threat—isoniazid and streptomycin have been found to be some what effective even when there is laboratory evidence of drug-resistance. In any case, the proportion of patients with initial drug-resistance is rarely high. It has been computed that even when as many as 30 per cent of the patients attending a clinic have initial resistance to streptomycin and/or isoniazid, the overall response to a standard regimen of PAS plus isoniazid daily for 12 months, with an initial supplement of streptomycin daily for the first 3 months, is very good, with only 5 per cent of the patients failing to respond because of initial drug-resistance. When the proportion of patients with initial drug-resistance is low, say, 10 per cent, only 2 per cent of the patients would

fail due to drug-resistance. On the other hand, inadequate drug-intake could lead to much higher rates of failure—5 per cent or more—even in patients who have drug sensitive cultures initially. Thus, standard regimens of isoniazid plus thiacetazone daily isoniazid plus PAS daily or streptomycin plus isoniazid, twice a week can be employed on a mass scale as a part of primary health care without insisting upon culture facilities and reports on drug-sensitivity. Culture and sensitivity testing would only confuse the physician, make the diagnostic and treatment procedures more expensive and sometimes may induce the physician to take wrong decisions. It would be more rewarding to concentrate one's efforts on improving patient compliance and the standards of diagnosis by sputum microscopy.

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Tuberculosis control and community participation

G.D. Gothi

New Delhi Tuberculosis Centre, New Delhi

The success of any scheme for community development, more so for the development of health services, depends on the willing co-operation and active participation of the community itself. No officially sponsored programme, however practical, useful and scientifically sound, can succeed without such participation. Such participation is indeed essential at all stages, starting from assessment of community's needs, planning of strategies to deal with the problem, finding resources, implementation and supervision of the programme. Naturally, community participation depends mainly on the community's understanding of the benefits that it is going to derive and whether its needs are likely to be satisfied and demands met with.

This is true of the National Tuberculosis Programme (NTP) also. This programme, which is based on epidemiological[1], sociological[2], technical, financial and operational considerations, was evolved in 1962[3] after a series of operational studies on BCG vaccination[4,5], case-finding[6] and treatment of tuberculosis[7] by the National Tuberculosis Institute (NTI), Bangalore. The NTP is fully integrated[8] with the general health services throughout the country. The institutions of general health services are made responsible for providing tuberculosis case-finding and treatment services to the patients residing in their areas of control. The health services are provided with necessary know-how, equipment and supplies for the case-finding and treatment of tuberculosis. The methodology recommended for case-finding consists of examination of sputum smears of patients who present themselves with relevant symptoms, specifically, cough of more than 2 weeks, at the dispensaries or primary health centres and other rural, semi-rural health institutions of the country. The patients whose sputa are found positive on direct smear are offered domiciliary chemotherapy free of charge for a minimum period of one year. Patients whose direct smear is negative for AFB are referred for chest X-ray to the nearest health facility, equipped with radiographic investigations. The results of chest X-ray examination are sent directly to the referring institutions. Patients diagnosed to be suffering from pulmonary tuberculosis are advised chemotherapy. Under the National Tuberculosis Programme, BCG vaccination is integrated with general immunization programme. Organisationally, the unit of the NTP, for reasons of administrative convenience, is the district. The district tuberculosis programme (DTP)[8] has two main

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components; the district tuberculosis centre and the peripheral centres. The district TB centre functions as a clinic and provides referral services to all the institutions of the district, imparts in-service training to the staff of the peripheral centres for case-finding and treatment of tuberculosis, supplies drugs and other items to the peripheral institutions, carries out supervision, compiles reports and provides guidance.

The programme is scientifically sound, operationally practicable, economically within the country's means and capable of achieving the objectives of gradual reduction of the TB problem and, in due course, leading to its control. However, among the unstated essentials for the success of the programme are two vital factors (*i*) the requisite will to work among the personnel involved and (*ii*) fullest possible co-operation from the population whom it is to benefit.

Although the programme has been in operation for almost two decades it must be regrettably admitted that the achievements fall short of expectations. For example, out of the average case-finding potential[9] of about 2,000 sputum positive cases of pulmonary tuberculosis in an average district, no more than 600 to 700 are newly diagnosed[8] per year. The performance in respect of case-holding and the immunization programmes is equally unsatisfactory[8]. Whereas a number of factors may be responsible for this state of affairs, the absence of health education and community participation are among the important contributory causes. It would, therefore, be appropriate for the present discussion to consider the performance in respect of the various constituent factors of the National Tuberculosis Programme and see how far it could be improved by mobilizing community support. It must, however, be admitted that there has been practically no worthwhile research on this aspect of the problem and any suggestions in this respect are bound to lack statistical evidence to support them.

Case-finding

As stated earlier, average performance under this head has been just about 1/3rd of the potential[8]. This could be due either to the failure on the part of the programme to attract patients and offer them satisfactory service or lack of participation by the community or both. Very few studies have been carried out to evaluate the comparative contribution of these two factors and only some indirect evidence is available on the point. Nagpaul *et al*[10] found that though 9·5 per cent of the total population in the villages studied had some sickness on any one day, only 1·3 per cent attended the area primary health centre. Further, although people aged 45 years and above had more sickness, yet they failed to avail of the services. The poor performance in respect of tuberculosis case-finding by general health institutions could therefore be attributed partly to lack of participation by the elderly population aged 45 years and more, constituting 23 per cent of the total population and having 50 per cent of the total sputum positive[10] patients in the community.

Another factor which could possibly be relevant is the distance between the patient's home and the health facilities. Nagpaul[10] reported that very few people in the villages care to go to primary health centres located at a distance of 5

km or more unless the symptoms are very pressing. In the cities too a similar finding was noted by Nagpaul[10] who found that for distances beyond 6·4 km from their residence, few patients bothered to attend specialized institutions. In general, the impression is that case-finding in tuberculosis in the rural areas has been hampered because of (*i*) lack of proper health education and adequate motivation (*ii*) distance of the PHIs from the patients homes (*iii*) lack of faith in the services and (*iv*) apathy on the part of personnel employed in the programme.

It would appear that the voluntary social worker has an obvious role to play in the situation. Health education, particularly in regard to the symptomatology of tuberculosis, the value of early diagnosis and regular treatment could be one of his functions. He could also help motivate persons with cough over 2 weeks or other relevant symptoms, to attend the Primary Health Centres as early as possible. Voluntary health workers could also keep in touch with the multi-purpose workers who have been recently inducted for preventive and curative work in villages. In a recent study conducted at the NTI (Aneja *et al*[11]) multi-purpose health workers were given brief training of 4 days' duration for screening the population and collection of the sputa from those who reported having cough of more than 2 weeks. The multi-purpose workers were also trained for preparation of sputum smears. The achievements of the study have been encouraging. In a period of 1722 man-days with the help of 26 multi-purpose workers who questioned 32,326 people, 1082 sputum smears were made. Of these 964 were satisfactory and could be examined. This led to diagnosis of 74 sputum positive patients. Under the programme of primary health care where the community health workers are to be selected by the community there should be better achievement than seen in the above study. The participation of the community health workers in the health services after a brief training for tuberculosis case-finding and management should improve the programme performance.

Case-holding

As in the case of case-finding, the performance of the NTP in respect of case-holding has been found to be quite unsatisfactory and it is essential that some means should be devised to improve results in this respect too. In urban areas the traditional method has been to employ health visitors to ensure regularity in collection of drugs and presumably in their consumption. Good results have been obtained at many places including the New Delhi Tuberculosis Centre, where, in addition to the health visitors the programme has the support of community leaders and social workers who have banded together in several Care and After-Care Committees. Provision of socio-economic relief and continuous intimate contact between the patients and the Centre has produced good results. It is however obvious that the same apparatus cannot be transplanted to the rural areas. Some preliminary studies have been carried out to see if voluntary workers can perform such a duty in the villages. In a study conducted by the NTI[7] (unpublished data) the tuberculosis patients were divided into 4 areas. In one area the drugs were supplied to the patients through primary health centres where the patients were

asked to come for receiving their drugs. To start with, the patients were taken to the primary health centre and thereafter they were advised to visit on their own for receiving the medicine from the doctor of the primary health centre. In another area, drugs were stocked with the village panchayat member and patients residing in the village were advised to collect drugs from them every 15 days. In the third area, arrangements were made for distribution of medicine through village level workers during the course of their regular visits to their villages and in the 4th area a specially appointed health visitor paid fortnightly visits to distribute the drugs in the patients' homes. The regularity of drug collection from any of the 4 channels was not different; hardly 30 per cent of the patients took their own medicines. It would thus appear that community participation in the form of village panchayat members did not improve matters.

Another pilot project[6] with a similar objective was undertaken by the Karnataka State Tuberculosis Association with financial assistance from the International Union against Tuberculosis supported by Tuberculosis Association of India, in 1962. The purpose of the pilot project was to prevent treatment irregularity. In each village volunteers were selected to supplement the Government tuberculosis service for prevention of default and persuasion of patients to complete one year's treatment and to direct people with symptoms of cough to the area primary health centre for investigation. The volunteers were supplied with lists of tuberculosis patients residing in the village under their care, with the request to motivate the patients for regular treatment. Intimation about the newly diagnosed patients was also sent to the volunteers through the laid down channels. The project by the end of the 5th year had 878 volunteers covering 559 villages and 4 medium sized towns. The volunteers were entrusted with 1313 patients of tuberculosis for ensuring treatment regularity. In all, they made 2038 home visits for defaulter control and motivation of patients. Although statistical data are not available, the results of this project were reported to be quite encouraging. The staff of the project, besides volunteers, consisted of one project officer, 57 group leaders (one for every 10 volunteers), 4 project organisers, a part-time typist, a clerk and a peon. It would appear that in this case the community health workers did make a useful contribution in respect of case-holding.

BCG vaccination

The role of the voluntary health workers in the BCG vaccination campaign would be to supplement the activities of the official agencies in preparing and updating lists of persons eligible for BCG vaccination, enlisting co-operation of the people in getting their children vaccinated.

Anticipated role of community health workers

No studies have so far been undertaken to evaluate the achievements following involvement of community health workers in a TB programme. In the context of the primary health care and 'Health for all by 2000 AD,' it would be in the fitness of things that the newly created community health workers are trained for delivery of tuberculosis

services as well and their performance evaluated. Studies involving the community health workers in different areas on case-finding and treatment of tuberculosis are urgently required. Pending such operational studies the community health workers could be assigned following role for tuberculosis control :

On case-finding : (*i*) Questioning of people aged 20 years and above residing in their villages for presence of cough of 2 weeks or more duration; (*ii*) collection of sputum specimens from persons having cough; (*iii*) preparation of sputum smears, (*iv*) delivering the smears to multi-purpose workers for onward transmission to area primary health centres for microscopy; (*v*) collection of reports of sputum smear examination; (*vi*) communication of the result to the patients; and (*vii*) collection of at least two more samples of sputum from people whose cough persists and whose earlier sputum specimen was negative.

On treatment (*case-holding*) : (*i*) Contacting individuals who have been found to be suffering from tuberculosis on the basis of sputum examination and other investigations; (*ii*) advising them to visit the primary health centre for treatment and drug collection; (*iii*) motivating them for regular treatment and regular follow up; and (*iv*) maintenance of records of tuberculosis patients of their village.

On prevention : (*i*) Preparing and up-dating of list of eligibles for BCG vaccination; and (*ii*) enlisting co-operation of the people for BCG vaccination of children by the multi-purpose workers.

On health education : Dissemination of information about the cause of tuberculosis, its symptoms, mode of spread of infection, procedure and place of diagnosis and treatment. In health education, the community health workers would constantly lay emphasis on the importance of prolonged and regular treatment and convince people that the disease is curable.

Training of community health workers

The training of community health workers for the above functions has to be organised at the area primary health centres and should form a part of overall training for primary health care. To start with, the training for tuberculosis services should be imparted by the district tuberculosis officer in presence of primary health centres' medical officers and its staff and ultimately it should be taken over by the staff of the primary health centre as they are responsible for overall training of community health workers.

Continuity of treatment and social barriers—

In the pre-chemotherapy era, social stigma and barriers were associated with to the disease, particularly in case of young girls of marriageable age. In general, tuberculosis patients were not welcome in the society and were treated as outcasts. Such a state of affairs still exists but to a much lesser extent and is particularly noticed among uneducated middle classes. The community has, by and large, come to know that the disease is curable and the patients soon become non-infectious after treatment and tuberculosis patients are therefore now well accepted in the society. The tuberculosis patients themselves do not feel that the society is going to boycott them. However,

health education of the community in general and motivation of the patients in particular by the community leaders and voluntary bodies whose primary interest is community welfare might help in breaking the social barriers that remain.

Suggestions for operational studies on tuberculosis

Some operational studies on tuberculosis case-finding and case-holding utilizing the services of multi-purpose and community health workers are urgently needed to lay down norms and parameters. Research data on achievements in respect of tuberculosis case-finding and treatment completion as a result of their participation are necessary for judging the efficiency of programme subsequent to their participation. Evaluation of the programme efficiency could be done by matching the reported performance against the expectations. For this purpose, studies are to be conducted in different parts of the country in representative districts having multipurpose workers and community health workers scheme in force. Such districts could be divided into 4 areas. In one area the performance of only community health workers should be observed, in another area that of the multi-purpose workers, in a third area the combined performance of multi-purpose and community health workers should be observed and in the fourth area neither the multi-purpose workers nor the community health workers should be involved. The comparison of achievements in 4 areas will reveal the efficiency of the different schemes individually or jointly. The studies could be undertaken where the services of multi-purpose workers and community health workers are available.

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Leprosy control and community participation

K.V. Desikan

Central JALMA Institute for Leprosy, Agra

The involvement of the community is of utmost importance in leprosy due to certain special situations peculiar to leprosy. It is an age old disease and for centuries there has been strong stigma attached to it, subjecting its victim to ostracism, social degradation and mental demoralisation. While it is a disease which requires a medical care and treatment there is an equal or even a greater need to restore the social stature of the individual and this is possible only when the society participates completely in correctly understanding the problem and removing the baseless fears and unfounded prejudices. The cause of the social reaction is not just a lack of knowledge. It is a deep seated bias being passed from generation to generation and it is not easy to remove. This is but one aspect of the problem involving physical and social rehabilitation. There is also the public health problem. Due to over crowding, insanitation and ignorance, the disease has been spreading and here again, nothing is possible unless the community shares the responsibility.

There are some other aspects also in leprosy which specially call for community participation. Firstly when the disease starts and manifests in the patient, it does not produce any physical suffering—no fever, no pain, no discomfort—nothing to make him rush to a doctor for relief. So he ignores the 'harmless' patches on his body. On many occasions, he does not know, and he also does not believe, that the indolent skin lesions are the beginnings of a morbid disease. Alternatively, if he does realize that it is leprosy, the repercussion in some of the people is so traumatizing that he conceals the disease or secretly gets treated from an unqualified person. As a result, the disease is not checked but advances producing all the damage that the person feared.

Added to this, is the general apathy of the doctor. Very few doctors like to treat leprosy cases. A doctor is also a part of society. Unfortunately, while the doctor should remove the prejudices and spread knowledge, it is a common experience that he also contributes to the general fear. This is due to his poor and distorted training. Such a serious public health problem is given a low priority in medical education. Leprosy patients are not admitted in the hospitals and teachers do not deal with the cases or teach the students. The result is ignorance and prejudice and even the fear that treating a leprosy patient might adversely affect his medical practice.

There is another misconception regarding leprosy. The only picture of leprosy in the minds of the general public is the pathetic scene of beggars in a pilgrim centre with distorted limbs, smelling ulcers and a repulsive appearance. The only anti-leprosy measure they consider is to house these unfortunate human beings. This view, unfortunately, is shared by many public health administrators and even some doctors.

The earliest work was to start homes for leprosy patients who had been thrown out of society. These were not hospitals, but settlements for destitute leprosy patients. There were a few homes scattered all over the country run by voluntary and philanthropic organizations. Some of these provided medical treatment also for patients who came on their own. Most of these institutions, managed by dedicated workers, were run excellently well, and they provided recluse to a small group of deserving patients. However, there was no link with the socio-economic or public health problem of leprosy. It was evident that if any dent has to be made in the leprosy problem, leprosy homes or leprosy hospitals cannot provide the answer. One has to go into society and involve the community.

The first experiment in this regard was initiated in Sevagram in 1951. Fortunately at that time, Dapsone was used for treatment of leprosy. Out of the funds of the Gandhi Memorial Trust, the Gandhi Memorial Leprosy Foundation was established in view of the keen interest taken by Mahatma Gandhi in leprosy. Instead of starting a centralized home or a leprosy hospital, outpatient clinics were started in the villages. An area for control work was marked out. The focus of attention was not just the leprosy patients within the control area, but the entire population. Not only curative aspects were dealt with, but also simultaneously the preventive aspects. The workers went round to all the villages and carried out intensive health education by contacting the villagers. Subsequently, with the help of the census records, every house in every village was visited and the entire population was screened for early signs of leprosy. The detected cases were started on treatment and were repeatedly followed up to ensure continuous treatment.

The feasibility of this new approach was questioned initially. Firstly, the healthy population, were not used to screening. Secondly, approaching the people with the idea of searching for leprosy could be resented and produce an adverse reaction. Here comes the importance of community participation. The workers at Sevagram control unit had established a good rapport with the villagers by their frequent visits. The people understood the importance of the project and therefore co-operated. The Sevagram experiment became a big success. It thus became a basis for the National Leprosy Control Programme.

A spin-off benefit of this approach was that better statistical information was obtained. Prior to 1950, there were no data pertaining to leprosy. At that time, there were 231 colonies accommodating only 28,000 patients. It was known that there was a very large number of leprosy patients, but the actual estimate was anybody's guess. Around 1950, it was felt that there were 15 lakhs of leprosy patients. Soon this figure was changed to 20 lakhs. When more figures

poured in from the various control units, the estimate was revised to 25 lakhs in 1971. The present estimate is 32 lakhs, detailed in Table I.

The success of the Sevagram experiment depended not only on the logistic methods, but also on the acceptability in the community. Every care was taken to see that the visits of the village workers to their homes did not disturb their privacy and did not embarrass them socially.

Table. Prevalence of leprosy in India

Names of states with degree of endemicity	Estimated average prevalence rate per thousand	Estimated number of cases in lakhs
I. High endemic states		
Tamil Nadu	20·0	7·0
Andhra Pradesh	15·0	6·0
Orissa	12·0	2·0
West Bengal	10·0	3·5
II. Moderate endemic states		
Maharashtra	7·5	3·0
Karnataka	6·5	2·0
Bihar	6·5	3·0
Kerala	4·0	0·8
Madhya Pradesh	3·0	1·0
Uttar Pradesh	2·5	2·0
Assam, Meghalaya	2·0	0·5
III. Low endemic states		
Gujarat	1·7	0·5
Himachal Pradesh	1·5	0·5
Jammu and Kashmir	1·0	0·2
Punjab, Haryana, Rajasthan	0·5	0·3
India as a whole	0·50	32·00

The National leprosy control programme : The National Leprosy Control Programme was launched by the Government of India in 1955. The objective of the programme was to control leprosy through a series of leprosy control centres engaged in following functions :

(*a*) Within the identified area of the Centre, all cases of leprosy were to be detected by survey of contacts, survey of school children, survey of whole population and by continued health education.

(*b*) All cases were to be treated at clinics located at convenient places. Of equal importance is the surveillance on the patients in order to see that they take treatment regularly.

(*c*) Survey of the area is to be done repeatedly to assess the effect of control methods.

For this purpose, 3 types of operational units have been established.

(*i*) Leprosy Control Units

(*ii*) Survey, Education, Treatment (SET) Centres

(*iii*) Urban Leprosy Centres.

Leprosy control units : These units are established in highly endemic areas having a prevalence of 10 per 1000 or more. Each unit covers a population of 200,000 to 400,000 population. The unit is headed by one Medical Officer. He is assisted by 10-20 paramedical workers, each workers covering a population of 25,000. The other staff in the unit consists of 2 non-medical supervisors, 1 laboratory technician, 1 physiotherapy technician and other supportive staff.

SET centres : These centres are established in moderately endemic areas with a

prevalence of 2·5 to 10 per 1000. Each centre covers a population of 25,000 population. It is looked after by 1 paramedical worker. The centre is attached to a general hospital or dispensary and the Medical Officer-in-charge of the general hospital or dispensary also supervises the leprosy work.

Urban leprosy centres : These centres are located in large cities. They are attached to a medical college or district hospital. One paramedical worker helps the doctor in treatment of cases and in follow up of the cases by home visits.

The number of Centres of above categories working at present are given below :

Leprosy Control Units	—	381
SET Centres	—	6595
Urban Leprosy Centres	—	430

In addition to the above control schemes, the following supportive activities help in the implementation of the National Leprosy Control Programme :

(*i*) *Reconstructive surgery* : In order to help in rehabilitation of patients, and to provide motivation for availing treatment, the Government has been establishing centres for reconstructive surgery. In medical colleges and other institutions where facilities for surgery exist, the surgeon is provided with necessary additional facilities to carry out corrective surgery for deformities. The total number of such units is 71.

(*ii*) *Temporary hospitalization* : To provide intensive treatment with more effective modern drugs, and to cater for acutely ill and complicated cases, temporary hospitalization wards with 20 beds each, have been attached to medical colleges. The total number of such wards is 199.

(*iii*) *Leprosy training centres* : With the progress of the work, there is an ever increasing demand for trained workers, both doctors and paramedical personnel. Training Centres were started at the time the control programme was started and more centres have been added each year. To date, there are 41 training centres. Of these 32 are being run by the Government and 9 are run by voluntary organizations. About 50 doctors and 1500 paramedical workers are being trained each year.

Participation by voluntary organisations : The voluntary organizations have played a prominent role in anti-leprosy work in India. They are the pioneers in the field and their work and experience has guided the Government to formulate the strategy of the National Leprosy Control Programme. They continue to participate in the control of leprosy. About 40 voluntary organisations are co-ordinating their efforts with the Government of India. Besides local bodies, several international agencies help the Government of India.

Objective achievements : With the efforts of the network of the various Centres, a substantial proportion of the population has been covered and cases detected. Details are given below :

Population covered by the projects :
—286 million out of
371 million

Population surveyed :
113 million

Number of cases recorded for treatment :
2·8 million out of 3·2 million

It is seen that there is a substantial work done in identifying cases and bringing them under treatment. However, a much bigger task and perhaps the most difficult task is to see that all the patients take treatment. Since the period of treatment is very long, the patients drop out of treatment. Hardly 30 per cent of the patients receive treatment with a reasonable regularity. Irregularity and discontinuation of treatment leads to a greater harm, by the emergence of secondary drug resistance.

Need for improvement in technology : While basically, the approach of the National Leprosy Control Programme is quite sound, there is a felt need to modify the operational methods. Experience has indicated certain problems :

(*i*) Since treatment is protracted, it becomes necessary to emphasize strongly on the surveillance of patients. More effective methods have to be evolved to ensure regular treatment, as the dropout rate is very high.

(*ii*) Case detection by mass survey is good method. However, it takes a long time and involves much expense and man-power. Quicker and cheaper methods have to be evolved without errors in information and statistical data.

(*iii*) The anchor of the entire scheme is chemotherapy. However, prolonged treatment with Dapsone has been producing sulphone resistance. More effective treatment with multi-drug regimens have to be evolved which are feasible and practical for field conditions.

(*iv*) Assessment of the work has to be carried out simultaneously.

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Training of health manpower for primary health care—some experiences

Y.L. Vasudeva

Department of Social and Preventive Medicine
Medical College, Rohtak

Three rural health training centres of Medical College Rohtak are located in three community development blocks, having 62 villages and a population of approximately 2,25,000. This area, in terms of institutions, has two primary health centres, one improvised health centre-cum-rural dispensary, one rural dispensary, one subsidiary health centre, one Ayurvedic dispensary, 36 sub-centres, manned by female multipurpose health workers, four extension sub-centres and 16 sub-centres manned by male multipurpose health workers. Besides, the Integrated Child Development Scheme is functioning, having 203 anganwadis. The community health volunteers scheme also exists, having over 102 CHVs. The training of indigenous *dais* is on. Near the Medical College in Rohtak, an urban slum area with a population of 20,000 is used for training and services. The Chittaranjan Mobile Training-cum-Service Hospital (with a bed strength of 500) is also there in Medical College, Rohtak. The latter hospital with its preventive, promotive and curative functions operates in distant rural areas of Haryana. The Medical College has training courses for under-graduates, postgraduates, nurses, multipurpose health workers, pharmacists, optimetrists, ophthalmic assistants, besides other technicians. The directives of the programme "Re-orientation of Medical Education" are followed.

Several training programmes for various personnel have been conducted. The experiences are narrated.

Training of village people for participation

This training is conducted with a view to promote community involvement in primary health care and to ensure propagation of relevant information. The basie aim is to see that individuals, families and communities can assume responsibility, at least for priority areas in primary health care. It is also aimed that the community may be made aware, and perhaps even vigilant about available services. This effort is made so that the village community can organise themselves and take local initiative, strengthened by village leadership. The curriculum is broad based so that it improves the quality of life and thereby primary health care.

The Ramalingaswami Committee (1980) stated the need for a voluntary base, with one representative from twenty families. The Kripa Narayan Committee

(1981), seeing the importance of community participation, said that "adequately mature and socially respected personalities in each village may be identified to be designated as a *Swasthya Pancha*". There are recommendations for an *Arogya Samiti* in a village. One could have turned to elected village panchayats for the said aims and objectives; but panchayats, particularly in the north (barring a few), do not give the impression and confidence that they are adequate for the required health tasks. The health tasks that may be achieved through panchayats are identified and are as follows :

The only organisation discernible at the village level is Panchayat. The same remains faction ridden after the process of election. At best, the panchayat serves a subservient role to higher echelons of the government and perceives the Block Development Officer or the Panchayat Officer as the authority. However, the panchayat, its members and the *Sarpanch* have been found to be reporting epidemics, asking for refuse dumps, removal or manure pits, demanding that the health agency carry out dog destruction, pest control, DDT sprays. Co-operative activities may be the provision of accommodation for sub-centres and health workers, or payment of rent for it. They may provide land for buildings for the health care. The panchayat often does agree to some "Do's and Don'ts" spelled out by health authorities.

The training for village people is viewed in two dimensions:—

(*i*) Creation of awareness

(*ii*) To create a base with volunteers who have prestige, self-reliance and social welfare in mind, with defined functions (Functional Health Committee).

Creation of awareness : Opinion leaders, both males and females, are trained in camps and are considered as initiators of community organisation of the village. At any point, 3 to 4 villages are covered and the population coverage is about 10,000 to 15,000.

The participants of male opinion leaders camp are selected on the recommendation of community health volunteers, multipurpose health workers, primary health centre supervisory staff and teachers, Block Education Officers, Panchayat Officers and Gram Sevaks, cooperatives and young farmer clubs, Indian Council of Child Welfare Staff and Red Cross Staff. The guidelines given for selection are : to include important members of extended families, kinship and caste groups; people who are expressive and have empathy for social work; panchayat members may be selected.

Training programmes have two components : firstly a description of the obligations of health care staff in terms of services, programmes their availability and accessibility to the village people; secondly, about the obligation of campers-actions needed in the village families. These are paraphrased into promotive, preventive activities and overall improvement of living.

The participants of female opinion leaders camps are generally recommended by child development projects, supervisors, anganwadi workers, *mahila mandals*. They may be women attending functional literacy classes, *mukhya sevikas*, *gram sevikas*, associate women workers, trained *dais*, women helpers. The curriculum focuses on

home economics, maternal and child health, family planning, immunization, civic education, literacy, health and nutrition education.

The teachers at the camp : Faculty of Social and Preventive Medicine including Professors, Health Educators, Health Centre Staff, Anganwadi Workers, Community Health Volunteers and Medical Interns teach the participants.

Exhibits, audio-visual material and actual cases are used. Two-way communication methods are used generally for training, such as simulation techniques and dialogues. The venue is health centre sub-centre/anganwadi worker's place/village chaupal/sometimes *Baithak* of CHV The resolve to communicate messages as widely as possible which have resulted from deliberations at camp.

Functional committee : We propose development committees with members from these participants, separately for males and females. Improvement in health and status of women would be the main tasks. Ultimately, financial support with levies through these functional committees may be expected.

We are planning to hold meetings on auspicious days like *amavas* and *pooranmashi*. Health and social welfare workers will go to different villages and one can expect almost unanimous cooperation from the village which is required for health and development.

The community has often offered help in several ways. Financial support, free accommodation, free land, voluntary services for preparation of food packets, health camps are but a few examples. However, for the community to feel involved, participation in planning and decision—making is necessary. Community participation is the crux of the problem. Dependence on the govenment often mars initiative. Alternative must be found—but only after the solutions at hand are implemented.

Training of community health volunteers

Community health volunteers were trained in batches of 20 persons. The training family comprised of teachers from the department of Preventive and Social Medicine, interns, programme officers and vaids. The selection criteria for the CHV's was : The CHVs between the ages of 20-35 years were debarred from enrolment.

— Only male CHVs would be selected (out of the 102 CHVs there is only one female CHV). This is not because the role of female CHVs is undermined, but because 203 female *anganwadi* workers were working as female CHVs,—and also nearly 150 trained *dais*.

— Ex-servicemen, having prestige and influence, were given preference.

— The selection of Scheduled caste CHVs was encouraged.

— The honorarium was not put forward as a monetary incentive.

— As far as possible, private practitioners in the village were excluded.

The trainers were convinced from the very beginning that it is through the CHVs that health promotion, prevention, community involvement and community participation for primary health care would get a tremendous push. The CHV along with leaders would organise the community, with special attention

to the economically weaker sections and other vulnerable populations.

During the training process, the goals to be achieved, job descriptions, and training course workers schedule (which had training methodology and contents) were clearly defined. The manual for community health volunteers was used. We framed our training objectives for the sessions mainly on the Meager's approach of defining terminal behaviour.

The following training methods were extensively used :

— Lecture-cum-discussion, basically through questions and answers.

— Simulation.

— Role play

— Case study approaches based on material from local areas which needed corrective action.

— Group discussions, problem solving exercises. Tangible results emerged by defining and re-defining their roles.

— Buzz sessions and Delbiq's techniques for priority work areas.

— Hand outs, pamphlets, leaflets and brochures were given to those who would be benefited.

— Audio-visual aids were used. Posters, slides, film strips, films, short group-training flip books, flip charts, flash cards, khadigraph were extensively used, demonstration models were other materials utilized.

Practical training was given in several ways. Postings at the health centre emphasised some curative and preventive measures, first aid and stressed referral. Actual demonstrations for these were given, and the CHV's actively participated. They keenly observed procedures like immunization. Health education was taught by the professors and qualified health educators. Demonstrations were given, where the CHVs, multipurpose workers in terns and occasionally Class IV employees participated regarding the construction of improvised dustbins, bio-gas plants, incinerators made with cans, grease traps, sullage bores, soakage pits and wells, lagoon pans, kitchen gardens, drainage systems, manure pits, compost pits, sanitary latrines, smokeless chullahs, rat catching, baiting and killing, and vector control. For reducing the fly population, techniques like catching, swatting, trapping fly proofing, tugon baiting, destruction of breeding places, tight packs and fly proofing through nets, were demonstrated. Mosquito Control was shown by reducing or eliminating the breeding places, desilting, biological control and others.

A library was made available to the instructors. Tutionals were held to ensure that skills were acquired by the trainees. An assessment of the CHV's, both before and after the training was done, with special emphasis regarding social work aspects, desired motivatoin, community organization, communication methods and job specificity.

Field work was another facet of training. Nutritional and health status was studied. High risk cases were identified. Relevant features of antenatal care, child care, nutrition supplementation, family planning, and immunization were taught.

Materials

The kits and materials provided to CHVs and multipurpose health workers

were repeatedly shown and their used explained. Related activities were emphasized. The discussions focussed on the action to be taken.

The discussions and training procedures were recorded with a view to share the experience with others who may want it. Insanitation is one of the greatest problems in the area.

Several problems beset this programme. The trainees have to complete the curriculum, in addition to other regular work. CHV's were used in other places to complete work pending at health centres, such as, bringing cases for sterilization during the training period, making stencils and filling registers.

District programme officers, together with district mass Information Officers, district Nursing Officers, Assistant Unit Officers, should be involved in training and review the training continuously. Further, training should not be started in all the blocks simultaneously. Regional Health and Family Planning Training Centres should also help in training.

Conversion training of unipurpose workers to multipurpose workers

A 45 days training programme for unipurpose workers was followed. The Unipurpose Workers to be trained included smallpox Vaccinators, Basic Health Workers (essentially malaria), Family Planning Field Workers and Auxiliary Nurse Midwives. Along with the said team, Medical Officers, Block Extension Educators, Sanitary Inspectors and Health Inspectors were also to be trainers.

Workers developed job skills chiefly while on the job. Excepting for auxiliary nurse midwives who had basic training of two years in ANM schools, job skills were acquired through the work experience in the rural sub-centres. In general, the multipurpose health worker trainees went through the same experience as the CHVs in terms of lectures, discussions, practicals, demonstrations, exercises, clinical postings and field work. Whilst training ANM's, special emphasis was laid on imparting skills regarding immunization, nutrition assessment, growth, ante-natal and post-natal care and family planning devices. Multipurpose workers were taught about water chlorination, measures for drought and flood, passive and active surveillance for tuberculosis and domicilliary treatment. A training methodology was evolved by analysing all activities and re-defining objectives and processes. Training was imparted for several roles—for example, both for leadership of a team as well as to be participative. The functions of different personnel were emphasised.

This system of training builds a strong base for health services for primary health care. When the male multipurpose health workers was at a sub-centre, his prestige and job satisfaction increased.

A lot of preparatory efforts are required from trainers and they have to be familiar with trainees—constant interaction is necessary. The trainers have to use teaching aids and training skills. In some cases, skills acquired by the CHV trainees are better than multipurpose worker trainees.

Problems such as per diem, stipends, and low pay scales have hampered progress. Unipurpose workers continue to draw the same pay after re-training. This has created major problems.

Training anganwadi workers

Anganwadi workers in our area like the CHVs have a distinct profile in that they are *daughter-in-law*. This reduces the problem of turn over and we used selection criteria ensuring necessary motivation. *Anganwadi* workers are given four months training initially, according to the syllabus developed by the National Institute of Public Co-operation and Child Development, at the Balsevika Training Centre located at Chandigarh. The syllabus emphasises child development, non-formal preschool education, health and nutrition education, functional literacy for adult women, community contact and communication. The syllabus is very well worded, specifies instruction goals, class room teaching, practicals and field training in each of the areas. We are not, however, happy with the community's perception of *anganwadis*; we want them to be like a *Grah Lakshmi*. We want them to impart health and nutrition education for others, as well as to be a mother, teacher and family counsellar—an informed group to lessen infant and childhood morbidity and mortality. We want her to perpetuate the creation of more *anganwadi* workers in each village home; we want her to work in an integrated fashion, for social, civic, economic, health, nutrition, and welfare development.

Retraining is conducted with this role in view, for a week. She works with ANMs in the *anganwadi* and in the sub-centres. All aspects of the required tasks are taught at the homes as well.

Some outcomes of this training are enumerated. Training has become meaningful to Interns. There is lot to be done in the community settings. Their attitude is more realistic. They appreciate the villagers' problems, are concerned, and ask for more resources for the villagers. All involved in this venture of service-cum-training develop increasing faith in multi-sectoral approach and this would lead towards the goals of primary health care. The scheme has developed a larger infra-structure. Continuing education and supportive supervision is more meaningful now. The team approach increases the range and coverage of essential services. The nutritional status of children have improved. Service priority is given for 'at-risk' children and mothers. The *anganwadi* institution has helped mothers to attend to other duties. Most significantly, regular monitoring of growth has helped the malnourished children with mid-course corrections. Through the Integrated Child Development Scheme, an information system is developing from village to block level.

Several problems are seen in this programme. The community has responded as well as we hoped. Functional literacy for women has not progressed, because of low status of women and because the village women have many daily chores. Pilferage of food is a problem. Some *anganwadi* workers are selected through influencial people for the monetary benefit and do not work. Better selection criteria may improve the services provided. For example middle aged women without encumberances, illiterate women (Jankhed) *Gram Swasthikas* and mother-teachers (Indo-dutch Project) may be better alternatives.

Training of medical students/interns

The guidelines outlined by the Medical Council of India recommendations

"Undergraduate Medical Education" are followed. Unfortunately the doctor is today the weakest link for proposed primary health care concept. The doctors' training should be such that he solves basic problems of medical and health care of urban and rural communities with sound knowledge and application of epidemiology, prevention and management. Two phases of training are recommended : a four weeks entry training and a three months training at the rural health centre during internship.

Four weeks entry training

This is done in urban slums in which each new student at Medical College does two hours family study on every alternate day and on the other days observations are discussed and inferences drawn. The student on this training is watched by team of auxiliary nurse midwives, lady health visitors, Health Educators and Physicians.

This exercise is undertaken so that the new entrant perceives health problems and develops the attitude required of the physician. Training for undergraduates is built on the data collected about social sciences, demography, statistics, health problems, health practices, prevention, epidemiology, management and national health programmes. This training leaves an imprint. The new students are sensitised to many problems, and afterwards they spell out the solutions.

Three months rural training (*internship*) : The design here follows the recommendations of the Medical Council of India as well as those of Re-orientation of Medical Education Scheme.

Preventive, clinical and administrative aspects as outlined in the recommendations are paraphrased, translated into tasks to be carried out and activities to be undertaken. A check-list is thereby made. The interns are posted with the CHVs and at *anganwadi* stations, sub-centres and health centres. The intern follow the methods of participant observation, project and problem study, management exercises, team training (a parallel of the health service structure), participatory interaction, and is involved in monitoring exercises.

At the end of the training the intern generally feels that the training was good, but does not choose this as his career. Perhaps, the workshop could solve this problem.

Most of the training is undertaken in the field and the following principles are adhered to :

—Exposure to the field is with a view to develop aptitude, interest and ability.

—Participation and experience are considered to be vital to develop skills and identify the roles.

—Analysis of the experiences is given high priority.

—Problem solving is an important approach, through which medical interns learn management and administration.

Nursing

Experiences with reference to three categories of personnel are made :

(*a*) ANMs (multipurpose workers, female).

(*b*) 18 months course of multipurpose workers.

(*c*) Staff Nurses in Nursing School of the Medical College.

ANMs : The author agrees with what has been stated in the Ramalingaswami Committee Report, "She is, therefore, neither culturally nor professionally suited for her job and represents the dilemma of most of the cadres we have evolved for our existing health services".

Of the several problems, the training of ANMs has left much to be desired. Their training faculty is far away from practical knowledge of rural health problems and their own training has been entirely hospital-based. Secondly, the location of ANMs training school is not apt; it is attached to a district headquarter hospital, generally, with an apology for a brief rural posting at the health centre.

Multipurpose worker (*female*) : The period of training has been reduced from 2 to $1\frac{1}{2}$ years; but the syllabus has been increased, *e.g.* Anatomy, Physiology, Psychology, Sociology, Hygiene, Nutrition, Nursing Procedures, First aid, Emergency Nursing, Child Health, Maternal Health, Family Health, Community Health, Midwifery, Domicilliary Midwifery, Family Planning and Welfare, Health Education, Communication, Basic Medicine, Pharmacology, Health Problems, Communicable Diseases, Mental Diseases, Environmental Sanitation, Health Statistics are taught, and these are related to theoretical, practical and field training programmes.

Tasks should be identified and time for the skills to be acquired should repeatedly be provided for. When will we learn to cut out something from training syllabii? We only add rather than remove something from the syllabii.

All, from the Ministry of Health down to the implementation level, are familiar with inadequacy of training with reference to the job requirements and, yet, movements are not in the right direction. If training at District Hospital is abondoned, what will happen to so many ANM school buildings which are there ? A plea is made to scale down training to the needs of the community and make it job-specific for the community to be served. The Training Faculty should endeavour to have field experience for themselves and should not re-delegate field training by sending trainees to any health centre, with the faculty sitting back. The faculty generally make a courtesy visit occasionally. If newer schools have to come, they should be constructed in upgraded health centres or they should be situated in the rural practice field areas of Medical Colleges.

The workers should be trained to have firm belief that self care is essential. They should be trained for nursing care in the village homes of the elderly, the sick, and where there are children and pregnant mothers.

The author has strong conviction that end of line workers should be like CHVs, *Anganwadi* Workers from the village or community they have to serve, as recommended by the Ramalingaswami report. The female CHVs and *anganwadi* workers could be further recruited for multipurpose workers training if they have the qualifications. Equity of distribution and integrated development should be emphasised in the training—both theoretically and practically.

Multipurpose workers (*male*) (18 *months training*) : Kartar Singh Committee recommended the new entrant should

have 18 months course. Nursing Council has given the syllabus. We are running the course as a part of the department of Social and Preventive Medicine. For the training process the lacunae are the same as those for female multipurpose workers.

Certificate nursing training

Student Nurses, whenever they are posted for community health training are put through a similar training process as that of medical interns, namely—analysis of the tasks, objectives and activities, family study, project study, observation, participation at the level of anganwadis, sub-centre and health centre and training for team approach.

Here, certain flaws requiring correction are pointed out.

1. Staff nurses are being trained as nursing orderlies and nursing aides. Nursing care should be planned and executed by them.

2. Student Nurses are utilized as staff nurse substitutes in hospitals and are, therefore, used as cheap labour.

3. Tutors, like the ANM School Tutors, have very little field and community nursing experience.

4. The curricula and training experience should be relevant to the primary health centre conceptual frame work.

5. There are too much restrictions placed on Nurses; therefore, their capacity to reflect and infer is not utilized.

6. The Nurse-midwife works even less than the doctors at primary health centres.

The project for nursing training is in the planning stage. Self-nursing care in the villages is also in the process of planning. The nursing care in the communities would include several features, such as :

1. Aspetic dressing for cuts and wounds.

2. Nursing management of burns at home.

3. Dehydration management.

4. Management of boils, impetigo and abscesses.

5. Management of fevers.

6. Treatment of red painful eyes.

7. Treatment of discharging ears.

8. Nursing care of the aged with nursing maladies (important ones being knee bending and sores).

9. Management of degree of debility.

Research areas

1. (*a*) Definition-community involvement in terms of primary health care.

(*b*) What are the areas of popular participation in primary health care ? What should be the training for that ?

2. Definition of service tasks that can be appropriationed to community level volunteers and end of line workers; the interaction needed between them; and what each should do singly and together. This will decide the training inputs.

3. Communication and supervision, vertically and laterally and appropriate training for this should be clearly spelled out.

4. Training for the use of easy and effective technologies should be encouraged.

5. Modifying training tools, including manuals as determined from effectiveness of services rendered.

6. What are the roles of training for team leaders and intermediate level supervisors and how should the same be accomplished ?

7. What is the pragmatic concept of health education, general education, adult education, functional literacy, extension education ? What is the scope in each of these ? Who and how to measure the effectiveness and impact ?

8. What, how and when the breakthrough in environmental sanitation, will mainly relating to waste water disposal, garbage and refuse, manure disposal and human excreta disposal occurs ?

9. Making multipurpose health work functioning at all levels *e.g.* health centres, district, state and centre.

10. Specific training for primary health care for those who have to operate and for all those who have to co-operate with it.

Appropriate Technology for Primary Health Care, 1981 pp 122-124

Appropriate technology in training of traditional birth attendants

V. Kumar, I.J. Walia and V. Bansal

Department of Community Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh and Primary Health Unit, Raipur Rani, District Ambala

Traditional birth attendants (TBA's) have traditionally been responsible for conducting deliveries in India. They are, therefore, accepted by the community because of a long tradition and cultural identity. These women are generally middle aged or old and mostly illiterate. They conduct 80 per cent of the deliveries in rural and 47 per cent in the urban areas. Apart from conducting the deliveries, they provide some post partum care to the mother and the child. Antenatal care is neglected.

Perinatal mortality, neonatal mortality and maternal mortality are high in the rural areas of India. The poor knowledge of identification and prevention of risk factors by the TBA's in the pregnant women and babies, lack of appropriate skills and some of their practices (harmful) contribute to the high mortality. In an effort to teach and train the TBA's, we conducted a study on 82 TBA's in a backward community development block in Haryana with a population of 112,000. Table shows some of the characteristics and practices of the birth attendants. While the TBA's are old and less expensive (they readily accept food grains, old or new clothing for the help they provide to the family) the trained birth attendants are young and more expensive.

Eighty TBA's volunteered to participate in an ongoing training programme on once a month basis. A training programme was evolved according to the felt needs of TBA's keeping in mind the financial and manpower constraints. The training was so evolved that it fitted with their cultural beliefs and traditional practices aiming at continuation of good and harmless practices and discouragement of harmful ones. The training material was prepared aiming for better management of conditions which lead to mortality and which can be prevented at low cost.

Initially the programme was organised in the Primary Health Unit. It was extended to another village in the block so that the travelling time and distance for TBA's was reduced. The number of TBA's attending the training session remained at 60-70 per cent of those who volunteered. The ongoing training programme was started in October, 1978. The TBA's were taught about identification of

Table. Jobs performed by birth attendants in rural areas

Job	Traditional birth attendants	Trained birth attendants
1. Food taboos during pregnancy, delivery and lactation	Yes	No
2. Recognition of high risk factors	No	Yes
3. Washing of clothes and soiled linen during post partum period	Yes	No
4. Disposal of after birth (placenta)	Yes	No
5. Helps in preparation and in cleaning the delivery room	Yes	No
6. Advice regarding tetanus toxoid, vitamins, iron, food during pregnancy	No	Yes
7. Prepares and serves tea during delivery	Yes	No
8. Ritual bathing of the mother and the baby	Yes	No
9. Massage to the mother	Yes	No
10. Harmful practices during delivery and in post-partum period	Yes	No
11. Provides first feed to the baby	Yes	No
12. Competence in conducting safe deliveries	No	Yes
13. Care of the newborn	Poor	Good
14. Cutting of the umbilical cord	Unclear	Clear
15. Personal cleanliness	Poor	Good

high risk pregnancy, conducting safe deliveries, antenatal care including nutrition during pregnancy, prevention of anaemia, prevention of neonatal tetanus, prevention of low birth weight babies, importance of timely resuscitation, promotion of breast feeding, care of the newborn, identification of high risk newborns and care of low birth weight babies.

During the first year, teaching was done by delivering lectures. Active participation of TBA's was obtained by discussion on their experiences and views on the subject of the lecture. This gave us an opportunity to learn about beliefs, practices and attitudes of TBA's. These have been incorporated in the training programme from second year onwards as mentioned earlier. The TBA's have been taught relevant skills and provided necessary low cost equipment to practice what they have been taught. They were encouraged to maintain records taking the help of school students in their village.

The training programme of TBA's has been strengthened by the use of appropriate technology. Spring balances (cost Rs. 7.00) for weighing newborn infants has been introduced for identification of low birth weight babies at risk. The TBA's can not read or write. The process of identification has been simplified by pasting tapes of three different colors across the weight calibrations on the weighing balance (Green for birth weight range 2200 g—5000 g, yellow for weight range 1800—2200 g and red for weights below 1800 g). Similarly, identification of short women who are at risk during pregnancy and child birth has been possible by the use of a bamboo stick (cost Rs. 1·00) on which red color

is painted below 145 cm, yellow color in the range of 145-150 cm and green color above 150 cm. A disposable sterilised *Dai* kit comprising of soap, razor blade, couple of cord ties, cotton swabs, gauge pieces, antiseptic solution and a paper napkin has been made available to all TBA's under training. They are using these 'disposable *Dai* kits' (cost Rs. 0·75) for cutting the umbilical cord and tying the umbilical stump of newborn babies. Thus, they are helping in the prevention of neonatal tetanus. A simple card with illustrations has been developed and TBA's have been trained to use it. The card consists of simple illustrations on diet advice, tetanus toxoid, vitamin and iron, high risk factors like swelling (oedema) pallor and bleeding during pregnancy, outcome of pregnancy, height of the mother and presentation of the baby during delivery. The illustrations on newborn babies relate to outcome, birth weight, breathing difficulty and feeding of the newborn. The TBA's have been trained to fill these cards (no language is used except for identification of the case and village). These cards are returned after 1 month of child birth. Based on the interaction in training during the first year, simple illustration on the 12 teaching sessions have been prepared and field tested. This will be available for use in other areas of the country in the form of a book and flash cards.

Analysis of 253 pictorial cards reveals a maternal mortality rate of 3·9 per 1000 births, a perinatal mortality rate of 59·3 per 1000 births and a neonatal mortality rate of 45·3 per 1000 live births. The risk factors during pregnancy were short women (height below 145 cm) 1·6 per cent, pallor 7·6 per cent, bleeding during late pregnancy 6·3 per cent, swelling over feet and face 6·3 per cent and presentation other than vertex 9·2 per cent. Tetanus toxoid was administered in 3 doses in 70·0 per cent women, in two doses to 25·7 per cent women and no tetanus toxoid was given to 4·3 per cent women. Breathing difficulty was recognised in 3·3 per cent, of babies, bottle feeding was started before 1 month of age in 2·9 per cent, and low birth weight recognised ($<$ 1800 g) in 6·6 per cent cases.

The appropriate technological aids for training of TBA's are at present under evaluation for their cost, relevance, acceptability, logistics, and impact on vital events. The operationalisation of these aids has been possible in one community development block. The task of training of TBA's who are illiterate, poor and old is a challenging one. A beginning has been made. The results are encouraging.

Appropriate Technology for Primary Health Care, 1981 pp 125-130

Appropriate technology for training of community health volunteers

L. Ramachandran

Gandhigram Institute of Rural Health and Family Welfare, Gandhigram

Appropriate technology in the training of community health volunteers is considered under three aspects—

(1) appropriate functions to be performed; (2) appropriate approaches for community involvement and participation; and (3) appropriate training methods.

At Gandhigram we have had the experience of two types of community health volunteers, (1) the school teacher, and (2) educated volunteers (male and female).

Eighteen teachers were tried as village health guides for a period of two years. There is no community health volunteers scheme in Tamilnadu as such. Ten villages were selected by the Institute in which village health guides have been identified, trained and tried out. Similarly village health guides have also been trained and used in five mini health centres.

The performance of the small number of community health volunteers whom we had trained for a month shows that they have picked up the diagnosis and treatment of minor ailments, whereas they are not sufficiently conscious and confident of looking after the preventive and promotive programmes.

We have learnt that we have to teach them the symptomatics of the disease more than the total pathology *etc.* In other words, they should be able to come to some conclusion and diagnosis from the *history* of the case itself.

A chart has been prepared which can be used by them as a guide or a scheme for ready reference. This chart is prepared for morbidity as well as mortality.

Regarding the drugs it is better to write the condition for which the particular drug is used on the label rather than write its chemical or patent name. They are able to pick up the right bottle for the particular symptom that they have come across. This does away with any element of doubt in the minds of the workers as to whether the proper drugs are being used or not.

In our experience in Gandhigram we have found that the use of ginger, ajwain, omam, garlic, kilanalli *etc.*, is very appropriate and specific in minor ailments like vomiting, giddiness, indigestion, jaundice *etc.* These are very simple things which have been used in our houses by the older generation and had been found very efficacious for certain

specific conditions. It is necessary for every trainer to sit with the guides and prepare a complete list of remedies that can be compounded locally at a moment's notice in any household. The use of hot poultices for boils by using flour turmeric powder, little oil or ghee is a time-honoured and proven method of relief of a boil/abscess without incision. The use of mustard plaster or even mud plaster for headache and for distension of abdomen needs to be revived and popularised. While talking of oral rehydration, administration of coconut water with a squeeze of lime in it, should be popularised. A piece of camphor burnt in honey helps in checking diarrhoea in children.

Environmental sanitation

A regular drainage system in rural areas is difficult of maintenance besides being expensive. The final disposal of the drainage poses another big problem.

We have found soakpits to be of immense use to drain away into the soil the waste water from the house. There are certain technical aspects in the construction of soakpit which have to be understood thoroughly. During the training, therefore, it becomes imperative to demonstrate from the beginning to the end the construction of soakpit and to make them do it on their own. The content of the soakpit is to be modified for different terrains.

Soak-wells will solve this problem of stagnant water very nicely. In one village we had an interesting experience. There was a lot of water stagnation around the community tap and digging a drain did not help. Later the tap itself was shifted by the villagers themselves across the road to reach the edge of the field. All the waste water was allowed to flow freely into the field and there was no need for soakpits and soak-wells *etc.*

In another village the community arranged a community garden by planting coconuts and other fruit saplings for the disposal of the waste water.

In some situations kitchen garden have been extensively useful. In particular when the households cannot afford to dig or find the material for filling up the soakpit. We have helped villagers with saplings and materials that they have to grow in kitchen garden having green leafy vegetables, papaya, guava *etc.*

Latrines

Regarding latrines there is no need to mention again that the guide or volunteer should know all the details about the construction and maintenance. But he should be able to identify houses where the latrine is feasible and possible, where space is available and where the economic condition is such that a latrine can be afforded.

He is also to educate the community about trying latrines on a community basis which can be cleaned by engaging a conservancy attendant or covered by the people themselves by putting a shovel or scoop of earth.

Safe drinking water

In the village we have found the following technologies appropriate for purification of water.

(1) Pot chlorination (NEERI, Nagpur method)

(2) Chlorination with tablets in individual houses in water containers. These are very cheap and available from chemists.

(3) Chlorinating the wells on alternative days with the help of village health guides. It is necessary to chlorinate the wells at such frequency for two reasons : (*a*) there is a continuous process of pollution going on which has to be combated (*b*) the people get used to the smell and taste of chlorine on a continuing basis There is actually no need to waste resources on renovations of well if people cannot afford it. Bleaching can take care of all the contamination.

(4) Educating the mothers to boil water—at least, the water that is to be used for the babies and children under 5 years of age.

Nutrition

It is necessary for the worker or guide to develop sufficient skills to identify under-nourishment. We have gathered some experience of nutrition education through community health volunteers in ten villages. It has been found useful to give a set of photographs of deficiency manifestations—angular stomatitis, keratomalacia, xerophthalmia, anaemia, kwashiorkor and marasmus. Typical photographs of such conditions will enable them to identify cases by an easy process of comparison.

Regarding the treatment and rehabilitation of the nutritionally deficient children the worker has to be trained over prolonged periods in the preparation of different food formulae by using locally available food stuffs. Nutrition demonstration in the house at micro-level seems to be much more useful than the demonstration at group level or community level.

Some lessons have been learnt from the evaluation of some of the nutrition programmes in the country.

In one situation Bengalgram and groundnut were used. But they were given in the form of biscuits and therefore, they were not accepted; rather there was a suspicion about why the biscuits were being given to children. In one project 'carry home' food was shared by others in the family and also what was demonstrated at group level was not prepared at family level.

Eighteen creches of the Gandhigram Institute of Rural Health and Family Welfare are providing supplementary feeding for children below 3 years. Locally available food stuffs are brought and prepared into different recipes every day. This is another opportunity which the community health volunteers can avail to demonstrate nutritious foods. The main lesson learnt in the experience is that acceptability is of high order when the local food stuffs are used and the preparation is done in front of the parents.

Nutrition education is a very time consuming process. But unless the health guide sits with the mothers and shows how different foods have to be prepared and given to the baby, the educational part will remain unattempted.

Another thing we have tried recently is to give bank loans to some of the villagers to purchase and sell vegetables and fruits in the villages. This makes vegetables accessible and available in the village which otherwise would have been available only in the nearest towns.

Functions of community health volunteer

It is necessary to limit the functions and activities of the community health volunteers to what is within their competence, keeping in view the very short duration of the training that they get. In the community health volunteers scheme that was recommended by the centres, some of the functions are beyond the competence of the community health volunteers. He/she should not be entrusted with the taking of blood smears. There is a six week's training in malariology exclusively for thick and thin film making and dissecting the mosquito. Despite such exclusive and intensive training some of the trainees still do not get enough perfection. It is therefore, unfair and unnecessary to give the task of collection of blood smear to the community health volunteers. For a fever case he may give aspirin and inform the corresponding multipurpose health workers. Similarly the community health volunteers should not be entrusted with any kind of immunization or vaccination. Immunization should best be done by multipurpose health workers of the government machinery or any voluntary organisation.

With the introduction of multipurpose health workers scheme in all the States there will be one multipurpose health worker (female) for every 5000 population. She should have as many indigenous *dais* under her as possible. This will relieve her to a large extent of the MCH load. The population to be covered by the each indigenous *dai* is usually not more than 1000 or so. Women community health volunteers should also be given training in aseptic midwifery and antenatal care and new born care. The training for antenatal care *etc*. should be done in the domicilary situation and not at the institution. At the institution a dummy should be used to show the passage of the foetus through the uterine canal.

For the community health guide or the indigenous *dai* there is no need to get skill in abdominal palpation in the early stage of pregnancy. At best they should be able to identify the head when it is fixed and know that the pregnancy is nearing full term. However, they should be able to elicit any difficulties faced by the pregnant mother and refer them promptly to the multipurpose health worker (female) or the supervisor. They should also be trained to identify high risk cases and repeatedly educate such cases to go to the hospital or health centre for delivery.

Regarding the sterilization of scissors, instrument *etc* and dressings for aseptic midwifery they should be encouraged to use the frying pan (*karahi*) with a proper air tight lid or use the *iddli* vessel.

Training methodology

The training should be essentially in the field. In the class room they take notes which serve the purpose of the examination at best.

After the preliminary orientation or briefing they should be allotted a number of houses for follow-up and once in two or three days they should be brought together for a review of what they have found in those families and what could be done. For the community wide problems of sanitation, they have to be taken round the village and shown on the spot what has to be done and each one should

get a chance of doing it a few times to get the methodology and technique correctly.

It is very essential to provide cheap educational material which they can use for family contacts and group discussions. This is the most important part of their work and most neglected so far. Health education has been religiously mentioned in all meetings and workshops for preparation of curricula but in practice the community health workers do very little health education. Our experience with the teachers shows that they are prepared to talk to cases which come for minor ailments. They feel shy to have the people in groups or in meetings and initiate discussion on the various preventive and promotive measures for health. They do not visit the homes either for education.

The training should be 90 per cent on health education and how to integrate health education in each activity.

An essential approach for community organisation is the identification of opinion and influential leaders and their training for involving them for grassroot level planning. During the training of community health volunteers this must be given a large attention. The community health volunteers cannot undertake any of their programmes as an independent, voluntary, isolated functionary. The involvement of the community through village health committees or mother clubs or youth clubs *etc* has been found effective for programmes like environmental sanitation, communicable disease control, immunization, vital statistics collection, family planning *etc*.

Learning from experience with community health volunteers in the limited area for the past three years it is considered that the following should be the minimum activities to be entrusted to them.

(1) Improvement of sanitation and personal hygiene.

(2) Nutritional deficiencies and their detection.

(3) Nutrition demonstration at the micro level in those houses where deficiencies are identified and also in houses where the supplementary feeding or weaning has to be introduced for children.

(4) Treatment of minor ailments, identification and diagnosis of cases more by history taking and the expression of symptoms than by physical examination.

Administration of drugs to be made easy by relating drug to symptoms on the label. The large use of household remedies and less dependence on pharmaceutical preparations should be encouraged.

(5) Trying to educate at least one important member in every family to take charge of health with regard to environmental sanitation, detection of minor ailments and their prompt attention.

(6) Ensuring proper immunization by bringing the services to the target population.

(7) For the female community health volunteer, midwifery and detection of high risk antenatal cases will be the most important additional function.

(8) The community health volunteers can be asked to function as depot holders for condoms. They should not be given any targets for bringing cases.

(9) Ninty per cent of the training should be for health education. Education for

contraception should also form part of this. It is however, not wise to give them any target for family planning because they cannot arrange for services. They should help in free discussion in the families about the need and the method of family planning and leave the rest to the health worker.

In our experience we have found that what was taught in the class room by lectures and discussion was fresh in their memory till the completion of the course. They could learn better after they had been put on their job by being guided, and also during review meetings by discussion. Small booklets can be prepared and can be circulated for them to read and they can be asked to come and discuss the same. The importance of small handbooks and hand-outs with illustrations cannot be overemphasised.

Appropriate Technology for Primary Health Care, 1981 pp 131-137

Simple and appropriate technology for preventive and promotive primary health care

Sushila Nayar

Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha

Components of appropriate health technology

While considering appropriate technology, one will have to think of the providers, the techniques and tools, and the recipients.

The providers of primary health care at the grass root level are village health workers or community health volunteers (CHV). We have found that school teachers can be very good CHVs. If we take into account the expectations from the CHVs, their proper selection becomes vital. Training of the CHVs and training of their trainers as well is important. It is difficult to talk of supervision or monitoring the work of CHVs. They are volunteers, who are to be selected by the community. It is, therefore, difficult to dissociate the role of enlightened community from the work of the CHV.

Next to the CHV comes the multipurpose workers (MPW). In a district like Wardha, where the MPW scheme was initiated in the first phase of its implementation, there is one male MPW for 8000 people and one female MPW for 10,000 people instead of one male and one female MPW for every 50,000. The MPWs are not quite adjusted and perhaps not motivated either, to do justice to the multifarious health activities entrusted to them. Proper selection and training of MPWs is an essential link in the provision of primary health care. Experience at Sawar in Bangla Desh has shown that the paramedicos can effectively meet all the demands of primary health care.

The techniques and tools will have to be simple, effective as well as acceptable to the community and the providers. They will be based on materials, available locally or which can be easily supplied. Experience has shown that simple material like match-sticks, could be effectively used for health education and one need not insist on sophisticated audio-visual aids. It is also well known that with salt, soda-bicarb and jaggery, oral rehydration can be successfully achieved. It is not always necessary to supply oral rehydration salt packets for this purpose.

The role of the recipients cannot be over-emphasised. The community has its own age-old practices. It is essential to identify practices which are good, harmful or without any particular influence. It is necessary to promote good practices and motivate the community to avoid harmful ones. Priorities of the community are varied and health care is not identified by them as a priority except for treatment

of seriously sick. Appropriate methods of health education, therefore, assume added significance. Leadership of the programme should be such that the community will feel, "we have done it ".

An enlightened and well motivated community will mobilise local resources to supplement and improve its primary health care, but these programmes can not be expected to become self-sufficient. Considerable Government support and supplementation will definitely be necessary.

Majority of rural community lives below the poverty line. In order to improve the nutritional status of children and the women themselves, Ambar Charkha and similar schemes, which can provide earning opportunities for the women in the villages, will go a long way in fighting malnutrition.

Health education

The first essential for primary health care in general and for preventive and promotive health care in particular, is making the people conscious of their health needs so that they will endeavour to provide it for themselves and their communities. It is well known that in the past, curative health facilities have dominated the thinking of all, including politicians, professionals and administrators, for the simple reason that treatment of the sick was the demand from all quarters. It also had an emotional appeal. The dramatic effect of seeing a seriously ill patient cured, makes a powerful impact, which is not provided by routine procedures of promotive and preventive health care, even though every one will agree that it serves no useful purpose to treat a sick person when twenty more are falling sick and will be soon coming for treatment. Men like Gandhiji who can say with firmness, "I am hard hearted enough to let the sick die, if you can tell me how to prevent others from falling sick", are few and far between.

It is, therefore, essential that our people should become conscious of the need and importance of preventing illness and promoting better health. Once the people begin to demand preventive and promotive health care, they will find ways and means of getting it. They will not only make use of what services are provided, but will also mobilise all possible resources at the level of the community as well as at higher levels by exercising pressures through their elected representatives to improve and add to such services. The first need, therefore, is to have appropriate technology for taking the message of health to the people. This will depend on (a) the level of development—social, economic and educational—of the community concerned (b) the type of person through whom health education is to be imparted.

Various experiments in the use of audio-visual aids have proved successful in imparting health education at various places. At Sevagram, a health exhibition coupled with facilities for questions and answers and a health check up when desired, has been found to be effective.

We have also made extensive use of little leaflets written in simple local language which are given to the patients when they come to the GOPD. The message relates to the problem the patient or the parents of the patient a re faced with. A few words by the doctor

incharge go a long way in convincing the patient. The message can be reinforced by other para-medical functionaries.

In recent times we have found the school teacher to be an effective agent of health education as a CHV. The prestige of the teacher in the community, his level of education and his influence on the children through whom he can approach the parents, have all added to his effectiveness.

Health education material to be placed in the hands of the CHV must be simple and written in a language which can be easily understood by the villagers. We have found repetition of one theme at a time to be more effective than efforts to give information on all essential aspects.

Appropriate technology in primary health care

The basic subjects which need emphasis for promotion of health and prevention of disease, are well known. These include safe and adequate water supply and disposal of waste water, proper disposal of human and animal excreta and house hold refuse, balanced nutrition, maternal and child health and welfare including immunization, communicable diseases control and family planning which is an essential ingredient of maternal and child health care.

The source of safe water supply in the majority of Indian villages and small town-ships continue to be the wells. It is important to remember that water supply should also be sufficient. Appropriate technology will involve improvement of the wells with proper parapets, covers and clean surroundings. Installation of hand pumps will be useful and will prevent contamination from the top. If handpumps are used, adequate servicing and maintenance facilities for the hand pumps will be necessary. It should be possible to train a village artisan for this purpose.

In areas where the sub-soil water is not potable as for instance in area of high salinity or has harmful ingredients as in the fluoride belts of Punjab and Andhra Pradesh, or where there is not enough sub-soil water as in a long belt from Mirzapur to Jhansi in U.P., piped water supply from a nearby river or rainwater tank becomes necessary. This will involve chlorination to make the water safe. ICMR has found a way of removing flourides from the drinking water by filteration through rice husk ash using the old three pot method. The rice husk ash can be rejuvenated by drying and heating. This method, I feel, should be used much more than has been done in the past.

In certain other areas deep tube-wells have been sunk for irrigation purposes. It should be possible to construct an over head tank and supply piped water supply for domestic use in such villages. This will need collaboration between the health and irrigation departments.

In the case of open wells, pot chlorination can give fairly satisfactory results provided certain precautions are taken. For instance sand and bleaching powder should be thoroughly mixed before putting it in the pot and holes in the pot should be at proper places. The pot should be filled with water and lowered into the water and pulled up a few times at the launching and then every night. This will prevent caking of the lime in the

bleaching powder which can block the holes and result in failure of pot chlorination.

Finally boiling of water by the individual families is the safest method and has to be resorted to in the face of epidemics. It can, however, cause considerable financial strain on the poor, in view of the high cost of fuel and social forestery will have to be developed to overcome this difficulty.

Along with provision of water supply, disposal of waste water must be undertaken in the interest of primary health care. Kitchen gardens by each family can offer a fairly satisfactory solution for families that have a little court-yard. Papaya, banana and some of the creepers can absorb a lot of water and also supplement the family food supply.

Soakpits can be an alternative answer, provided there is proper maintenance of the soakpit to prevent its clogging. A little piece of gunny bag or dry wheat or rice stems placed on top of the soakpit, will prevent the household grease from choking the soakpit. This cover can be removed, dried and burnt every few days and will enable the soakpit to function for at least 6 months.

In more difficult sectors, a proper drainage system can be introduced suited to the local topography. With increasing menace of filariasis, disposal of waste water has assumed much greater importance and urgency.

Disposal of human excreta is most important and hand flushed water seal latrines are the only answer. The outlet can be bifurcated and connected with two pits. One pit is used for six months. It is then closed down and the connection with the 2nd pit is opened. Before closing the outlet to the 2nd pit the first pit is emptied, its contents used as manure, and its connection with the latrine is restored.

Animal excreta and household refuse can be disposed off in manure pits. Elementary precaution of sealing the filled manure pit properly so that there are no cracks in the mud-plaster, will prevent fly breeding.

Animal excreta can also be used in *Gobar* gas plants. In some places human and animal excreta are both fed in the *Gobar* gas plants. Besides supplying gas, the residue is rich in manure. The Panchayat can use the gas for street lighting, and individual families for cooking as well as for household lighting.

In moderate and small size towns, where there is no shortage of land, oxidation ponds are very successful. This method will need a sewage system to take the sewage to the pond, where it will decompose. A distribution system to use the effluent for irrigation purposes, will also be necessary. The Panchayat or the Municipality can run it and not only the sale of the effluent will pay for the maintenance of the oxidation pond, it is possible to earn something more for providng other services to the community, over and above the advantages of freedom from hazards of insanitary disposal of excreta. The algae growing at the edges of the oxidation pond, is a rich chicken feed and can be sold for this purpose.

The third essential requirement for promotion of health is proper nutrition. Failure of Applied Nutritional Programme has brought out vividly the need of cooperation of all the departments dealing

with development—agriculture, irrigation, marketing and supply, roads, electricity, price fixation, provision of seeds and fertilizers *etc.* so that the community can produce the foods required for their own balanced nutrition, especially to meet the needs of the vulnerable groups, instead of concentrating on cash crops. The farmers will not grow the necessary food crops, if the benefits of growing cash crops are far greater than of growing say lentils, oil seeds, or vegetables, fruits and cereals.

Further, the planners must see to it that when a dairy is set up and milk purchased from the individual house holders, an adequate amount is left for the need of their own children. In milk producing areas, cream and butter may be sold for earning money, but butter milk or skimmed milk must be given to the children, pregnant women and nursing mothers. The nutritional needs of the 0-3 years age group need special attention.

As in the case of dairying, in coconut growing areas, the coconut oil may be sold, but the coconut cake mixed with palm *Gur* can make a delicious and nutritious food supplement for the vulnerable groups. Along with a handful of puffed rice, a coconut cake jaggery *laddu* has long been used as a common breakfast food in the villages of Bengal.

Similarly in groundnut growing areas the oil can be sold and the cake can be mixed with *Gur* and roasted gram flour and made into a nutritious food supplement at the village level. There are many other preparations that have been introduced by the Mafatlal Group using groundnut cake. Soyabean preparations evolved by the Food Technology laboratories at Mysore can be and should be made of much greater use to improve the nutrition of vulnerable groups.

Needless to say, the protein supplements, without adequate calories, are not going to serve any useful purpose. This message has to be carried home to the community as also to the health workers at the periphery and all nutritionp rogrammes must be planned keeping in view this aspect.

Nutritional blindness is much more common in south India than in the northern villages of Punjab and Haryana. The habit of munching raw carrots by children in the North, provides them the much needed carotene. A massive nutrition education campaign is necessary to fight this serious preventable disability, by improving the nutrition rather than by administering massive doses of vitamin A to our children. It can be easily done, though vitamin A may have its place in the interim period.

For MCH care and family planning, the CHVs can function as excellent motivators. With the help of village health committees and with the support of the medical and para-medical staff of the PHCs, demand for services can be generated and also met both with regard to family planning, immunizations and other necessary services for mothers and children. The supply of vaccines and iron and folic acid and other requirements must be regular and in time.

All those who are working in the field of preventive and promotive health care, are aware of the wide spread shortage of essential vaccines like DPT and rabies vaccines in recent times. Simple technology which may be appropriate for our

villages to take the much needed health care to our people, will succeed only when the people demand the services, and prompt provision is assured when service is demanded. A villager should not have to go back without the requisite service for which he or she has come. All of us know of PHCs and OPDs of hospitals where cases of malaria, tuberculosis and the like have to make several trips to get the necessary medicines. This is fatal for the success of the national programmes of communicable disease control and eradication, family planning and MCH services.

Instead of having a continuous year round programme of immunizations 'pulse' programmes might be more effective. This will solve the problem of providing cold chain continuously and will ensure better utilisation of transport and trained manpower. The community also will be more alert and come to get the service on the days announced, when they know that the service will not be available on other days.

The component of curative services in primary health care is limited but vital for the promotive and preventive services. It helps the CHV to establish his or her credibility in the community and more important is the fact that first aid services must be available in the village itself so that development of serious illness or complications can be avoided. Simple drugs, material for treating simple wound and conjunctivitis, oral rehydration with salt and sugar in water along with a few drops of lemon juice, can prevent many serious complications and a lot of avoidable expenditure.

Refresher training and guidance

Refresher courses for the staff to keep up their enthusiasm and adequate motivation at all levels are also necessary. The refresher training must not result in the interruption of services and therefore, should be carried out through peripatetic teams, so that the visiting teachers will not only conduct the refresher course, but also provide consultations and guidance to solve the difficulties experienced by the staff working in the field in far flung areas.

Involving allied services

Support of other departments will mean health education for them so that they are aware of the why and wherefor of what they are asked to do. For instance PWD, Railways and others often leave borrow-pits along the roads and railway lines under construction which breed mosquitoes after the rains. They will have to realise the importance of interlinking these pits so that water spreads and gets absorbed, rather than being allowed to stagnate and breed mosquitoes.

Education department must see to it that health and nutrition education forms an essential part of teachers training curricula and text books for children include health education which forms a part of language studies. There used to be excellent stories with health education message in the primary school text books in my childhood, which is not seen any more.

Involvement of all development departments in primary health and acceptance of primary health as an integral part of development by the planners,

is an essential part of developing appropriate technology for the provision of promotive and preventive primary health care for all in the next two decades.

The first essential, therefore, is simplicity of services and techniques, secondly regularity as well as reliability of the services provided and of the visits of the staff who are to provide the services. Base line honesty and integrity, coupled with efficiency at all levels, is necessary if we are to provide health for all by the year 2000.

Appropriate Technology for Primary Health Care, 1981 pp 138-141

Health education for primary health care

J.S. Gill

Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi

Education is the art of utilization of knowledge[1].

Health education implies improvement of people's knowledge, attitude and practices in relation to health and disease.

Everybody knows what is health education. Everybody is willing to pay lip service to it. But how much health education is actually being done, and how far does this fall short of some reasonable (though as yet undefined) goal ?

These questions are not easy to answer. State Health Education Bureaux now exist in 20 out of 22 states and 5 out of 9 union territories; while 84 districts now have health education units of the type recommended by the Central Bureau of Health Education. According to a study conducted by CHEB[2], most health education units suffer from lack of funds, poor physical facilities and shortage of trained manpower. At the training level, it was found, for example. that most colleges of nursing or teacher training institutions do not teach health education as a separate subject.

No data on how much health education material have been produced, distributed or actually utilized are available. One would like to go round and find out how many posters, flash cards *etc.* are available with each Community Health Volunteers or multipurpose worker. According to the CHEB study mentioned above, the training programmes conducted by the primary health centres for CHV or MPW are not sufficient to equip them to deliver health education services effectively.

It is not easy even for me to collect all the health education materials that are needed. What happens to health workers posted in peripheral areas can be easily imagined.

The situation in health education is similar to that in several other sectors. Some services are available, and more are needed, both quantitatively and qualitatively. And there are constraints—monetary constraints, administrative inertia, and lack of imagination: What is special about heath education, why should it merit special consideration ?

Importance of health education

1. The basic premise of health education is that people's health depends primarily on what they do or do not do, and only secondarily on the medical profession.

2. Health education is one of the major strategies to achieve health for all by 2000.

3. Health education can promote community participation.

4. Health education can check dependency, encourage self-reliance.

5. It can foster healthy life style and a small family norm.

6. Health cannot be imposed. People have the right to make their own decisions. Health education places "people's health in people's hands".

7. Many health problems are self-created. Health education can remove prejudice, superstition, bad habits and other cultural factors that imperil health.

8. It can encourage better utilization of existing health services.

9. It can create demand for better health services.

10. It can reduce exploitation of ignorant patients by unscrupulous practitioners and quacks.

11. Health education can create vigilant and informed public opinion that can help both the formulation and observation of good health legislation.

12. It can help organize the community for joint action in areas such as sanitation, nutrition.

13. Health education can help create community health resources.

Some problems

The overall experience with health education has not been entirely happy. One reason is that we have tended to follow the Western model. Often health education has been regarded as teaching backward, superstitious and uneducated villagers the benefits of modern medicine —with trappings of dependence and promotion. If the people did not accept these innovations, they were blamed. Even where well trained health educators have been used, the results have been unproductive, both in the developed and developing countries[3,4].

All this has happened because we have ignored consumer realities. The consumer is the central figure. The emphasis must shift from the teacher and his teaching to the learner and his learning. We have not studied the determinants of his health behaviour, or the motivation to learn and change. We have not studied the communication patterns that foster or hinder learning. For instance, can we rely on a single medium for a single message, or do we need some mix of group approaches and individual approaches? We have not fully realized the importance of word-of-mouth publicity, and the role of opinion leaders. How to identify or motivate opinion leaders? We have not studied how to fit A-V aids to the different perceptual patterns of different groups. Take a very simple example. Posters which are self-evident to city dewellers do not convey the same meaning to villagers. While using these posters in rural areas, a volunteer had to be posted to explain their meaning. Lastly, we must check each component of health education for relevancy and appropriateness.

We could have blamed our villagers before the green revolution, but we have no such excuse now. They can change if we approach them properly. We should meet them as fellow human beings, avoid talking down to them, remember their culture, build on what they have, and let them learn on their own terms. The approach to health education is as important as its content.

Strategy for health education

One must first face up to the magnitude of the problem. In my view CHEB is not enough, even the whole health services are not enough. We must integrate with the total educational effort. Development is very much an educational process, and health education is a part and parcel of that education for development. If you split it off and hand it over to health departments only, they do not have the size, equipment or other inputs to do justice to health education.

Therefore, my main recommendation is integration of all educational inputs and all educational programmes—at various levels. For instance, at the Block level, there is need to pool all the educational resources: equipment, and personnel such as:

— School teachers
— Nonformal educational personnel
— Adult education personnel
— B.D.O. and Extension Officers at Block level : Education, Agriculture, *etc.*

— Animal husbandry staff
— Mukh Sevikas or Block PROs
— PHC staff
— ICDS staff and SNP staff
— Voluntary agencies.
— Industry *etc.*

In the same way, there is need for integration at the other levels—such as village, taluka, district, state and central levels.

The central idea is that there should be only one agency, or one *web*, for all education. Health education is just one strand in this web, intertwined with all the other strands. This web should look after all the educational needs, including health education. Health education in schools and colleges is naturally a part of general education.

There is need also for more effective utilization of mass media including print media.

The author would particularly like to draw your attention to our second mass revolution (the first was the green revolution) *i.e.*, the transistor revolution. Even where there is no railway station, bus stop or post office, and nobody buys newspapers, you can always find the humble transistor receiver. In a survey by Indian Adult Education Association, covering 25 villages in Rewari, (Haryana,) 1271 receivers were found to be in use (50 per village). Mostly you find people listening to film songs. Can we use the same transistors to carry health messages ? This is a major challenge. There is need to study people's listening habits, and experiment with different approaches.

This transistor wave is indeed a massive wave. How are we going to hitch a ride on this wave?

Thirdly, we may turn to a big area of appropriate technology—to our folk culture and folk art. We have a very rich and varied folk tradition. There are puppet shows, *nautankis*, *yakshgan*, *tamasha*, recitals of epics, and many other forms of folk theatre and fok art. We have only scratched the surface so far: there are a few puppet groups working for Family Welfare. We need regional folk art centres which can effectively utilize local folk art forms for health education. This is difficult creative work. We must be able to interest top creative artists in each region

and each art form. Apart from creating new plays, stories, *etc.*, we can also try to smuggle in health messages into traditional popular plays, stories, songs, ballets, *etc.* There can, for example, be criticism of unclean habits ("wash your hands before eating"); cleaning and bathing can be shown as part of "*shingar*" (remember advertisements for tooth paste); people can be shown buying, carrying or eating vegetables; heroes can boast of their good health, mothers of their small families. Suitable incidents which implicit health messages can be culled out of our epics and myths. There is a whole world of folk art awaiting exploitation and adaptation.

There is need for lot of experimentation and evaluation to judge the efficacy of this appropriate approach to the appropriate technology of folk art forms.

We can also try and see how effective professional advertisers can be. Many countries are using them for high priority health education work.

Moving pictures are undoubtedly the most popular A-V medium. In a country where the majority cannot read, nothing can match the effectiveness of moving pictures.

There is need to go into the details of the mechanics and cost-effectiveness of large-scale use of modern technologies such as films, video-tape television, communication satellites, *etc.* They are the appropriate technology of the future—may be the near future.

Exploitation of opportunities offered by teaching institutions such as schools and colleges is still very inadequate. I am running a health training programme for Delhi college students for the last 6 years. Every year the students tell me it was most useful and should be made compulsory. During pre-training assessment we found their health knowledge little better than that of the general population.

School children are at the right stage to consolidate life-long habits of cleanliness. In backward areas, these children can prove effective in carrying health messages home, thus indirectly educating their parents and other children ("child-to-child" education).

Lack of health education posters *etc.* in a Delhi hospital was even pointed by our Prime Minister.

When people visit a hospital, they are more likely to be receptive to health messages.

Each hospital should have a Health Education Committee to organize health education activities, and to motivate doctors. Perhaps "clinical health educators" can be trained, and hospital doctors can prescribe health education on the treatment card, because they are familiar with this system.

Lastly let us not forget that human engineering is a new, subtle and difficult art.

Every technique has its limitations—inherent limitations and practical limitations. We cannot lay all the blame (or credit) at the door of Health Education.

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Appropriate Technology for Primary Health Care, 1981 pp 142-145

Preventive and promotive aspects of nutrition

Parvathi Rau

National Institute of Nutrition, Hyderabad

Nutrition forms a very important aspect of primary health care. Many of the nutritional problems in rural areas are preventable. This can be done through the active co-operation and participation of the community. Our experiences in rural areas to overcome these problems with local village technology are briefly described below.

Our earliest experience was a supplementary feeding programme for preschool children carried out by a group of *mahila* and youth club members who had been motivated through discussions with staff members, demonstrations and visits to the Institute's nutrition museum. They cleaned, cooked and distributed the supplement in the form of a *laddu*, three times a week, for 14 months. The children showed better growth performance and decrease in overt signs of PEM[1]. This was community participation at its best, but unfortunately there was no self-generation and the programme stopped when the raw materials were withdrawn.

A teacher is considered a learned man in rural areas and is a highly respected member of the community. We explored this possibility in a nearby village primary school. After a brief training in the various aspects of nutrition in relation to the school, he inspired the children to grow green leafy vegetables, drumsticks, fruits like papaya, taught nutrition through skits, songs, charts and the like, involved the parents in the education programmes, held exhibitions, used the mid-day meal programme for teaching nutrition and allowed children to take home the school produce. As a result, the children seemed more active and their knowledge regarding vitamin A deficiency and its treatment with green leafy vegetables and papaya had improved.

But the teacher was transferred and the new man who lived outside the village was not interested in the school garden. In about 4-5 months, the garden was barren. The people considered the new teacher as alien and this was probably the reason why he did not get the response due to him from the community. He probably had all the qualities of a good teacher but was not an educator.

A group of teen-age girls in another village wanted to learn crafts like sewing, knitting and cutting. They agreed to our nutrition education in exchange for learning crafts. We developed a Flip Chart showing the most commonly occurring nutritional deficiencies like avitaminosis-A, vitamin B-complex and PEM, their causation, prevention and cure with local foods, sketches, photographs and cut-outs from magazines. These disease entities were well known but their prevention

and cure were not understood. The sessions were conducted bi-weekly by two of us with recapitulation after every topic.

The evaluation of their gain in knowledge was through a nutrition card game devised by us. The success of the education programme was seen when the girls identified and successfully treated florid cases of PEM in their village with locally available foods and prevented unnecessary branding and intake of herbal medicine involving dietary restrictions.

But the programme was disrupted due to village factions and fighting and we had to gracefully withdraw. This is another example of the right type of training producing a good educator provided there is interest and motivation to learn. An incentive was necessary, as in this case, for sustained interest.

In a nutrition clinic set up at the Primary Health Centre level to identify and treat PEM cases, all the cases were treated with the 'Hayatnagar mix' a low cost food supplement made with locally available foods, by the local *mahila mandal* members. Our objective here was to study the feasibility of delivery of nutrition services through the existing health set-up like the PHC. Nutrition education was given to the parents along with the packets, based on local beliefs and practices regarding illness. Out of a total of 98 cases treated at the PHC, 26 were contacted again after 6 months. A better gain in wt/ht^2 index was associated with better knowledge and practices of the parents. It was also seen that the more severe the PEM, the more receptive was the mother to nutrition advice. The study revealed that the mothers could be divided into three categories[2].

1. Mothers who were convinced about the role of dietary factors in PEM and continued to practise (32%).

2. Mothers who were convinced but followed the advice only for short periods due to either economic reasons (36%) or that the diet was needed only for the cure of the disease (20%).

3. Mothers who were not convinced about dietary factors (12%).

The category I mothers served as messengers of nutrition in their villages and brought other PEM cases to the clinic. It was also found that none of the siblings of these cases developed PEM.

This demonstration was successful but the subsequent functioning of this model as a part of the PHC was beset with many problems namely the low priority accorded to nutrition programmes, frequent transfers of staff and general apathy among the staff.

With the experience of using *mahila mandal* members, teachers, school children and mothers of treated PEM cases, to spread nutrition messages, the feasibility of using trained local young men with about 8-10 years of schooling, was tried out in 3 villages near Hyderabad, in the wake of the National Community Health Volunteers' Scheme. Their training was directed specifically at tackling health and nutritional problems of children with special emphasis on preventive and promotive care, monitoring growth of the children and imparting nutrition education and treatment of minor ailments including diarrhoea with oral fluids[3].

The salient features of this study were as follows:

1. The infant feeding practices and beliefs regarding PEM before and after the CHVs had been functioning showed a marginal change.

2. But on the other hand, the knowledge about the need for fluids and food during diarrhoea, the use of orosol, the significance of weight in relation to disease in children by means of the growth card, as well as the preventive and promotive functions of the CHV were well understood.

3. Health and nutrition education appeared to have received very low priority with the exception of one village where 86 per cent had heard the message and seen the aids.

These results indicate that service-oriented education like vitamin-A prophylaxis, immunization, treatment of diarrhoea with orosol, monitoring of growth and recording of the weight on growth cards which involved frequent contacts and treatment of minor ailments were better received than nutrition and health education *per se*.

All these experiences show that different types of people can be used to deliver nutrition services, provided proper incentives, motivation and training are given.

Considering a supplementary feeding programme, this should come from the community to the community by the community. In other words, a community granary should be created in each village where all those who can spare foodstuffs, pool their resources which can then be used for feeding programmes. Nutrition education must be initiated for all members of the community along with the feeding programme which will then serve as a demonstration-cum-feeding programme. Villages in India are usually divided into bastis or localities, where local volunteers should be made responsible for the beneficiaries from that area to the central feeding spot. In the Philippines, locality wise feeding programmes seen to be quite popular, with local contributions.

The community also needs to grow the foodstuffs needed for feeding programmes for which incentives should be given to the farmers through the active co-operation of the agriculture and extension departments. Mention must be made here of the ENP in Orissa some years ago where the poorest mothers and their children were fed everyday through local contributions and voluntary services of the *mahila mandals*.

The growth card and monitoring of the weight of the child and recording it seems to be a very useful nutrition education tool and we feel that the CHV is ably suited for this purpose. He can be helped by local volunteers and any gross weight fluctuations can be corrected quickly through proper nutrition advice. We had also taught our CHV's to record important childhood diseases like fever, diarrhoea, measles *etc.* by a code letter in order to understand the reasons for any sudden fall in the weight of the child.

We also feel that a face-to-face or house-to-house education or in small groups, again locality wise, would work well. Ideally, women can be contacted at the washing ghats or the village wells where they tarry to gossip. Men can be found in the main square of the village or at the panchayat office or the CHV's

house. These points should be closely studied before venturing to educate the community. The local hakim or medicine man can also do his bit for nutrition education through dietary advice when prescribing medicine with some help from the CHV.

But all this is possible only when proper incentives are provided in exchange for participation and these should come from the community itself. How the incentive should be given should be left to the community.

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Appropriate technology for prophylactic immunization

R.N. Basu

Ministry of Health and Family Welfare, New Delhi

The outline of tasks to be performed in the delivery of immunization services are presented. Each task must be included in the job description of the health workers of the vaccination team. The materials furnished may be modified and adapted to suit local conditions and circumstances.

Immunization schedule

An immunization schedule should be available to each member of the health staff, so that he can refer to it when deciding which immunizations to administer to a particular person. The schedule should contain the following information :

(*i*) vaccine to be given.

(*ii*) desirable age at which to administer the first dose of each vaccine.

(*iii*) number of doses which should be given of each vaccine.

(*iv*) minimum time interval between successive doses of vaccines.

A copy of national immunization schedule may be seen in Table I.

Vaccination session

All hospitals, dispensaries, maternity and child health clinics, primary health centres, sub-centres are suitable places for conducting vaccination sessions. To provide services close to people, it may also sometimes be necessary to organize vaccination sessions in other selected sites in the villages (outreach activities). The staff in this case, have to travel from health centre to vaccination sites on the scheduled day and time regularly. Immunization of school children must be done in the schools after prior appointment with the teachers.

The number of days in a week at which vaccination sessions are to be held, will depend on various factors such as the number of children and mothers expected at the session, and availability of staff for this particular work. If there are fewer than ten children to be vaccinated each day, the vaccines and time of health staff may be wasted by holding daily sessions. The interval between session can be three days, one week, two weeks and one month. It will be easier for the people to remember if it is held at least once in a week. The time of the session (morning/afternoon) must be convenient to the local people. Once the day and time of sessions are decided, vaccination services must be available as scheduled and announced regularly.

Table I. Schedule of vaccinations

Age	*Vaccination*
Pre-natal	Tetanus toxoid 1st dose, 2nd dose (at monthly interval)
Children :	
3-9 months	BCG vaccine Diphtheria-Pertussis-Tetanus (Triple vaccine) -3 doses at an interval of 1-2 months : Polio (Trivalant oral vaccine) 3 doses at an interval of 1-2 months.
9-12 months	Measles vaccine : one dose
18-24 months	Diphtheria Pertussis-Tetanus (triple vaccine) booster dose. Polio (Trivalent oral vaccine) booster dose.
5-6 years	Diphtheria-tetanus (bivalent vaccine) booster dose.
(school entry)	Typhoid (monovalent or bivalent vaccine) one dose. After an interval of 1-2 months the typhoid vaccine one dose.
10 years	Tetanus toxoid booster dose. Typhoid (monovalent or bivalent vaccine) booster dose.
16 years	Tetanus toxoid booster dose. Typhoid (monovalent or bivalent vaccine) booster dose.

Pre-natal : For a mother who has been immunised, one booster dose of tetanus toxoid should be given in subsequent pregnancy preferably four weeks before the expected date of delivery.

Children : Ages indicated are considered to be the best times. However, if there is any delay in starting the first dose of triple vaccine, the ages may be adjusted accordingly. It should be the aim to ensure that a child receives BCG, DPT and polio vaccination, where available before it reaches one year of age. The different vaccines indicated against the various age group can be given simultaneously : example, BCG triple vaccine and polio vaccine.

When typhoid vaccine is being given for the first time two doses at interval of 1-2 months required to be given.

Vaccination equipment

Some guidelines have to be given to the health workers. There should be sufficient number of syringes and needles for vaccinating the anticipated number of children. Cleaning and sterilization should be done at the end of each session, so that they are ready for next day. The plungers have to be taken out of the barrels of the syringes and rinsed in clean water. All the syringes and needles can be put into a saucepan or pressure cooker. Enough water should be put so that everything is covered at two centimeters of water. The water is boiled for 20 minutes. Syringes and needles are placed in a container which has been previously sterilized by boiling.

Vaccine handling

Vaccines have to be transported and stored at recommended temperature and the guidelines may be seen in Table II. The Do's and Do not's for maintenance of refrigerator can be seen in Table III. Vaccine carriers with ice packs, which have been provided to all the primary health centres, should be used for transporting vaccines. The vaccine is not exposed to the sun, the vaccine is kept cold during the session. The vaccines should not be used after expiry date.

Administration of vaccine

Small tips go a long way in helping the health worker. Polio and DPT vaccine, if available, can be given in same session. Polio should be given first, otherwise the child may cry after receiving the DPT injection and resist any further attention. BCG vaccination be given in left arm, so that scar may be used as an indicator.

Table III. Recommended vaccine storage time and temperature

Vaccine	Shelf life of vaccine	Transport to State/Distt	State/Distt. Store	Transport to PHC	PHC	Subcentre
DPT/ DT*	1½ years at 4-8°C	4-8°C	3 months at 4-8°C	4-8°C	1 month 4-8°C	1 week at 4-8°C
TT	1½ years at 4-8°C	4-8°C	3 months at 4-8°C	4-8°C	1 month at 4-8°C	1 week at 4-8°C
BCG	8 months at 4-8°C	4-8°C	3 months at 4-8°C	4-8°C	1 month at 4-8°C	1 week at 4-8°C
Oral polio	2 years at —20°C	—20°C to —30°C	3 months at —20°C to +8°C	—20 to +8°C	1 month at 4-8°C	1 week at 4-8°C
Typhoid	1½ years at 4-8°C	4-8°C	3 months at 4-8°C	4-8°C	1 month at 4-8°C	1 week at 4-8°C
Measles	2 years at —20°C	—20°C to — 8°C	3 months at —20°C to +8°C	—20 to +8°C	1 month at 4-8°C	1 week at 4-8°C

Caution : Never use vaccines after expiry date. Never freeze DPT, DT, TT and typhoid vaccines, Keep diluent at +4°C a few hours before use

As BCG leads to local ulceration, from operational point of view, it may be given along with third dose of DPT and polio, instead of first or second. The only children who should not be immunized are those who are critically ill. Malnutrition should not be considered a contra-indication.

In case of oral polio vaccine, the following points may be specially remembered.

(*i*) Do not give the vaccine to any child suffering from dysentry, diarrhoea and vomiting.

(*ii*) Do not give hot drinks for a period of half-an-hour after the administration of vaccine.

(*iii*) Do not dilute the vaccine in water, milk, or syrup before its administration to the child.

(*iv*) Sterilize the individual spoon for delivery of vaccine drops, in boiling water and cool it. Do not use antiseptics or disinfectant.

Follow up

The mothers have to be told that reactions are possible after vaccination, what they are and what to do if they occur. The guardians must understand why their children are being immunized (benefits), which diseases they are being immunized against and why they have to bring the children back for injection. Follow up for re-visit will be easier, if

Table II. Do's and Don'ts to get the maximum use of refrigerator.

Do's

1. The refrigerator must be placed in a cool room, away from direct sunlight and at least 10 cm from the wall to allow the free circulation of air.
2. The refrigerator must be absolutely level, if it is to work well.
3. The plug must be fixed permanently to the socket so that it cannot be accidently switched off.
4. Voltage stabilizers should be supplied with each refrigerator.
5. The refrigerator must be kept locked.
6. Vaccines must be stacked neatly with enough space between the stacks for free circulation of air.
7. Plenty of ice or ice packs should be kept in the freezer compartment and sealed soft plastic bottles with water in the shelves (but not in the door of the refrigerator) not utilised for the storage of vaccines, to keep the temperature down if the refrigerator stops working.
8. The refrigerator must be defrosted periodically.
9. The temperature in the refrigerator must be checked twice daily and performance records maintained.
10. Spare or replacement parts must be kept in stock. For kerosene units, keep two spare wicks, a wick cleaner, two spare glasses and two tins of kerosene. For electric units, keep four spare fuses. When the spares have been used, these must be replaced at once.
11. For kerosene-operated refrigerators, make sure that the flame burns evenly and gives a blue flame.
12. For kerosene-operated refrigerators, always strain the kerosene oil through a fine cloth.
13. A sheet of paper must be taped to the outside on the door of the refrigerator which tells anyone finding the refrigerator not working :
    (*a*) whom to contact;
    (*b*) where to check for a blown fuse;
    (*c*) where to get a repair man; and
    (*d*) alternative place for vaccine storage.

Don'ts

1. Keep the vaccines in the door of refrigerator. This is the warmest place of the refrigerator. Preferably black this area permanently with insulation material.
2. Keep food or drink in the refrigerator.
3. Open the door unless it is necessary.

(*Contd.*)

each vaccine is provided with an immunization card indicating date of particular vaccination.

New technology

Ice lining refrigerators for vaccine storage have been constructed and are being tested in ten stations of India. This refrigerator functions efficiently even if the electricity supplies are unreliable and voltages vary widely. Vaccine storage temperatures in the main compartment are maintained when only 8 hours of electricity are provided in each 24 hours cycle in an external temperature of +43°C. At this external temperature, the electricity can be interrupted for up to 40 hours before the average interval temperature will reach +10°C.

Cold boxes are specially constructed boxes with all the sides fitted with thick insulation material that keeps warm air from getting into the vaccines and cold packs. The use of rigid urethane foam as insulation material keeps the vaccine cold (4-8°C) for 45 to 58 hours, exposed to temperature of 43°C and 32°C, respectively. These vaccine carriers are now manufactured in India.

The use of contaminated syringes, especially when they are used over and over again, can cause infection. The disposable syringes, now available, are too good to be discarded by health workers after single use. A non-reusable type of syringe will shortly become available. It is not simply a disposable syringe but one that cannot possibly be used a second time.

Needed research

The following areas of research on EPI are of interest for effective implementation of programme.

(*i*) Increasing stability of vaccines (measles, polio, pertussis).

(*ii*) Reducing the need of booster dose (DPT, polio).

(*iii*) Introducing simple techniques of vaccine administration (*e.g.* use of bifurcated needle).

(*iv*) Improving the cold chain (ice-making machine).

(*v*) Motivating the community.

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Health information for decision making in primary health care

K. Ramachandran

Biostatistics Unit, All India Institute of Medical Sciences, New Delhi

Health information is a representation of the reality of a 'health care system' in terms of the state of the system, the events that occur in the system, the procedures and processes followed. It has to represent the planning and operational aspects of health care as well as the biological and social aspects of the population groups at which the care is directed.

Health information, looked upon as a system by itself has two components, 'Intelligence' and 'Engineering'. The former denotes the knowledge (the end products of processing information) contained in the information system, and the latter, the process of acquisition, analysis, storage and retrieval of information. Health information by way of health intelligence is needed for input planning; that is, for planning services, its structure, continuity, standards, as well as for assessment and improvement of effectiveness of services in terms of measureable outputs.

Health intelligence in the context of health care planning requires information (*i*) on the existing state of health care with reference to availability and deployment of health service resources—human, financial, equipment *etc.*, as well as projections of supply against potential demand of these resources; (*ii*) for assessing community needs; (*iii*) on current health service activities; (*iv*) on utilization of such activities; and, (*v*) on the effectiveness of services provided. Such information is not available presently at a national or state level.

Among the physical resources, man-power probably is the most crucial resource since health care is labour intensive. A national approach to man-power planning in the context of primary health care is possible only if at the state level (as health is a state subject) the current availability and future supply of all categories of health personnel can be determined. Information on future supply would include information on training facilities also. It is important in this context, to stress the need for clear decisions at the governmental level regarding the pattern of health care that the State will follow. Next in importance would be information on financial resources. Very little information is currently available on money (at the family level) spent on health care. Projections regarding costs should take into account the possibility of community contribution to financial resources. There is a great need for information on available equipment, their utilization and future

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needs at different levels in the health care system. Supportive facilities at the primary health centres, districts, state and national level, need to be assessed and future needs projected. Needs as pointed out in health care literature, are in essence, perceptions. Assessment of need, therefore, depends on the perceiver. It is difficult to think in terms of objective information on all aspects of needs. Factual data of different types can be collected that may permit an understanding of current and future perceptions. The decisions in this area are likely to be more than simple logical analyses.

Information on health service activities and their utilisation should be available from the health care service records. However, where the recording system is not well planned or implemented it may become necessary to carry out special studies to acquire information. Information on service activities is essential for a clear understanding of the costs and effectiveness of interventions used. In addition, such information helps greatly in breaking down unthinking rigidities that may have crept into patterns in health activities at different levels. For health services research also, this type of information is crucial in order to evolve self-correcting mechanisms for improvements in standards of care which are 'non-threatening to the staff'.

Finally, information for improving the effectiveness of the health services is of great importance. Unfortunately, this is an area beset with a number of difficulties. A major difficulty arises because of the inability to isolate quantitatively the effects of the health care services from other confounding effects present in the environment. Also, the very process of collection of information can introduce distortions. For example, cervical cancer screening shows an apparent increase in prevalence of the condition; changes in diagnostic criteria produce distortions; changes in the knowledge of the public can give rise to increase in certain conditions.

Decision making involves taking initiatives and risks, mobilising resources and committing oneself to action in the future. Information for decision making in health care has to come both from the information system which is a part of the health care system and from other sources. There is need for special studies and surveys to supply adequate information for planning. What has been described so far, are some of the features of an acquisitive intelligence system at a central level for purposes of planning health care. If such a system is to be successful in the long run, it should be linked with short-loop feed back mechanisms at its different levels *viz.* the Primary Health Centre, Taluk, and at the District level. This will provide information to the persons responsible for working the system. In other words, the functional planning and regulation of services at different levels should be facilitated to the maximum extent possible through the feed back of relevant information. In fact, the justification for a health information system springs from its ability to contribute to decision making at all levels through its short-loop feed back mechanisms.

Decentralisation and self-reliance are the corner stones of the primary health care approach. How will this, or can this principle be operationalized within the existing health system ? Has the

degree of decentralization needed and feasible in the Indian Context been defined ? What organizational and administrative changes are required ? What managerial training of staff at different levels are to be effected ? The health system as it stands today is highly centralized in terms of decision making, planning and control. Therefore, there are only afferent mechanisms of information management. As yet there is no attention paid to possibilities of decentralization in decision making. Consider the primary health centre. The medical officer is responsible for the management of the primary health centre and supervision of the staff but he has no function of meting out reward or punishment to the staff working therein.

Another aspect of the health system is its inflexibility. Every district and block has a uniform and fixed number of staff position. Health requirements are assessed or assumed to be similar everywhere irrespective of population size, socio-economic conditions and topography

Let us look at the existing reporting system. In most of the states, more than 60 forms are used to generate information about health services. At the PHC about 40 monthly reports, 8 quarterly reports, 3 half-yearly reports and 20 annual reports have to be submitted. In addition, of course, there are always ad hoc reports to be submitted. At the sub-centre, the ANM regularly maintains and submits 13 monthly reports. In the MCH services alone the ANM maintains 10 records ! These records and reporting systems are designed at the higher echelons of the health hierarchly for use exclusively at their level. The staff responsible for collecting and compiling the information is neither adequately trained to do so, nor does it have an opportunity to appreciate the value of all information that is sought from above. The total lack of training in the use of data collected to improve their own work performance, is a major deficiency in the system.

Now let us turn our attention to performance review. It is based on confidential reports related to number of days toured and fulfilment of targets laid out by someone higher up. The contents of the confidential report, the basis on which it is written, are not in general known to the staff. The very choice of the elements for performance review vitiates efficiency and effectiveness. Quality and coverage of services cannot indeed be reflected by counting the number of days toured. The system is interested in shadows and not reality. Targets are set at state level based on population data and no account is taken of the actual needs and realistic possibilities of meeting them. In fact, careful enquiries at the population level reveals that a substantial proportion of the people in rural areas are not even aware of the existence of health institution, the type and range and usefulness of the service offered, and their right to avail of them. This lack of awareness contributes to their relying on quacks or going without treatment. This also leads to poor utilization of services.

Studied decentralization is the key to staff participation. Management training and a keen sense of appreciation of one's own work and that of others associated in a team is essential.

The most important activities in primary health care will have to be directed towards increasing the health

systems, capability to identify, manage and solve health problems starting with the neediest of the needy, who do not at present have any social or economic leverage. Service delivery will have to be designed such that it is directed clearly to identified target groups—to talk of maternal and child health for the rural population is not good enough. It has to be directed on a priority basis to the sections of the population who are in greatest need. Detailed operational plans will have to be carried out to identify such target groups and study their problems and felt needs. The strength of an information system lies in its functional effectiveness.

If we expect a participatory approach to develop as part of primary health care, it is absolutely essential that not only the providers but also the users should be involved in the identification of needs and problems in planning and priority setting, in decision making and implemention. It has to be explicitly recognized that 'needs' may differ from place to place. The present approach to defining needs in strictly epidemiological terms has to be modified qualitatively. A different way to define needs would be to start from the people and ask them what they think are the prevailing health problems. In short, social, economic and cultural dimensions have to be added to epidemiological data.

Decentralization of authority, skills for planning and decision making need to be instituted. For example, the auxiliary nurse midwives could be given the responsibility to determine their own work programme based on a study by her of the requirements of her area. Procedures have to be laid down for the approval of this work programme by the team at the primary health centre. Further, we should accept that within a broad policy framework each district and block can assign responsibilities and tasks, allocate resources and set targets according to local priorities and health needs of the people. That is the degree of flexibility needed in a country of our size with wide variations in the social, economic and cultural dimensions.

A simple health and management information system for use at various levels can be developed, only through experimentation for atleast a short period of time. The existing proforma and records should be carefully analysed in an integrated manner, their use studied, as well as a concurrent assessment made of information needs at various levels. No readymade solution can be offered by mere desk research. This system should be made in consultation with those who are going to generate the information and utilize it. That is the only way to make sure they understand it and produce authentic information.

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Culturally acceptable contraceptives

L.V. Phatak

Birla Institute of Medical Research, Gwalior

In human evolution death has baulked the individual and the society all along. As a result there is a universal desire to perpetuate human life as an individual and also for continuation of society. This is one of the bio-psychic needs influencing human society prompting continuation of race, society, family and last but not least the man himself.

With this basic status of conception, contraception can ordinarily be imagined only under special circumstances. When the human society was organised and the ethos of the joint family developed a child was not just another human born in a present belonging to it ! Thus, childbirth had a legal status and had to have social acceptance. This is also linked closely with the sanctity of marriage which is necessary before childbirth/conception. Social stigma is naturally attached to a childbirth out of wedlock since the organised society and its laws got accepted and it still continues. Unfortunately this affects the female partner only. Contraception thus has been felt necessary for social reasons for quite a few centuries now. To avoid undesired pregnancies, even emasculation was made compulsory in certain service personnel in some circumstances.

Over the years a change has come in the cultural acceptance of many practices. With advance of science the mode of enjoyment of the five senses has altered and the older methods got replaced. These changes have come to be accepted as a part of cultural change with the passage of time, Examples would be, the advent of cinemas, musical stories, eating in restaurants, modern way of dressing, use of gadgets *etc.*, that have come to stay to satiate our eyes, ears, taste *etc.* Media and easy transport has added influence in bringing about these changes. Sex pleasure however has all along continued to be considered as inseparable from the resultant pregnancy. The idea even of delinking of these two aspects of a sex act, at least for a respectable woman, has never occurred. The man on the other hand, not having to face the outcome, could do without the necessity of contraception to enjoy himself.

With the increasing human population and receding natural resources, contraceptives have received serious attention in countries where the death rate is remarkably low and the rate of literacy is high. The sustained capacity of reproduction is a vital necessity for the couple and more so to the female partner who is replaceable when necessity arises.

There is however, a feeling of fulfilment in this direction when two sons and a daughter are born to a couple.

The sex of the offspring thus is an important cultural factor linked with contraceptive practices and this factor is so far beyond any control of science.

For prevention of pregnancy for the mothers health or other reasons, abstinence has been observed indirectly by religious and social groups. There appears to be thus a concerted effort to control conception only if everything remains undisturbed. The methods of contraception, thus such as IUD when propagated receive lukewarm attention for spacing; probably the acceptance of sterilization rather than opting for other methods is also due to the same reasons. A condom however, seems to be gaining popularity in its acceptance though not in its sustained practice. A demand for contraceptive injections too may also be due to the associated secrecy and apparently undisturbed sex act.

The Birla Institute of Medical Research in its rural health activities during 1978-81 have had some experience in studies regarding the acceptibility of the contraceptives. The Institute has taken up a rural health cum development project based on the Alma Ata philosophy of primary health care from April, 1980. During the last 11 months detailed information has been gathered from 20 villages with a total population of 10,800.

144 persons from four villages have been supplied with condoms by our social worker. There are other 136 males from additional four villages who do use condoms irregularly. It was during the time of conducting soco-economic surveys that these men became acceptors. It may be noted that in one village the initiative for the use of condoms came from some women who are literate and are members of *mahila mandal.*

Control of conception has to be developed from below upwards and not promoted based on population programmes or scientific advances only. It is necessary to undertake promotion of the programme without offending cultural, religious and normal values and susceptibility of a society to our working methods. These vary in a vast country like ours. What is rational for a couple may be totally irrational from the standpoint of society's welfare and this gulf has to be bridged. That is where it is felt that control of conception is over medicalised and has to develop from the community.

An ideal contraceptive has been defined as innocuous to health, reliable, reversible, ethically acceptable, cheap and easily available. We are however considering only one of these aspects *i.e.*, cultural or ethical acceptability of the available contraceptives. With the population explosion in sight it is absolutely necessary to promote acceptance for spacing or termination by all in the reproductives age groups. To achieve this, the methods that we promote have to suit the prevailing convictions and educational status of the acceptors, besides making an efficient service available. The cafetaria approach can be made successful but its implementation needs a serious consideration of the circumstances of the acceptor while choosing a method. This requires serious study. It also requires a balanced attitude on the part of the person who would provide the necessary contraceptive service.

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Cultural acceptance of family planning— an experience in the promotion of the small family norm in a tribal area

Ragini Prem

Agrindus Health Project, Banwasi Sewa Ashram
Govind Pur, Mirzapur

Planning a family is not a new idea what is new about it is its context of a small family norm. India is facing the problem of steady and substantial increase in its population over past few decades. Increase in the population has caused increase in the demand for basic commodities as well as the employment opportunities and welfare services. This extra demand to find means to support life has lead to the present concern for family planning. But limiting the size of the population is only one aspect of the problem. The real problem is that of finding happiness for everyone in the society.

The size and growth of the population of any society at a given period is the resultant of the economic and cultural environment during the period concerned and its immediate past. Therefore, a mere comparison and figures for population and birth and death rates from different countries is not justified. The programmes developed to control the population without developing a full understanding of the population dynamics are likely to get wrong orientation and their achievements are likely to be much below expectations. Such programmes on the contrary may promote resistance in the society.

The planners say that the small family is the key to prosperity. Every individual wants to be happy and to be leading a properous life. Yet educating the people to accept the small family norm, and motivate them for suitable action, has proved to be difficult and time taking. This is specially true of the rural poor. Why is it so ?

The rural population which forms the bulk of our country, has always been a puzzle in the context of the national development. To a large extent it has remained unaffected by the policies and programmes for development. Does it mean that villagers lack any ambition for a better standard of living ? Are they really inert, very lazy and sluggish ? Can the villages, specially in the poverty stricken and the backward areas be motivated to fight against their poverty ? What can be the motivation ?

Urban situation is apposite to the one in villages. The people in the urban area appear some what abscessed with the

idea of continuous growth and development. They also work very hard to achieve it and are always quite receptive to the new ideas. What contributes to this gap needs to be understood if family planning programmes are to achieve success.

It is a well recognised fact that urbanization or an opportunity for a better standard of living is a good motivation for adopting family planning. Based on this observation an action research project was undertaken by Banwasi Seva Ashram in the Sonpar tribal area of the Mirzapur district. This project called. 'Agrindus Family Welfare Project' worked on the hypothesis that, given an incentive, remunerative employment opportunities, health servics and education, the rural concensus will favour a small family norm.

Agrindus Family Welfare Project had a community approach to family welfare. The project aimed at the all round development and awareness building of the families and of the community and not mere limitation of the number of children in a family. This was achieved by integration of the health and family planning activity with the other activities of the Banwasi Seva Ashram for the development of agriculture, animal husbandry, village industries, education and organisation of communities working on the basis of concensus for self sufficiency and self reliance (or for Gramswarajya). For developing these various programmes whole village community was treated as one unit.

The approach for the promotion of family planning was to encourage a dialogue in the community on the various aspects of the subject and provide know-how about the methods of contraception to the eligible couples. The eligible couples including those with one child, were introduced to more than one methods so that they had a choice. These couples were persuaded through repeated personal contacts but not hunted as targets for family planning. The different family planning services were made available to the people in cooperation with the government and other private institutions.

It was seen that there is a positive correlation between the general awareness, the initiative for progregss in the village and the acceptance of small family norm, favourable attitude to family planning and practice of contraception. The educational approach to family planning extension is effective in introducing it not only as a means of limiting the family size but also as a way of life.

Though the study was concluded in September 1972, the family welfare programme was carried forward and developed further on the same lines. Since 1973 the programme of comprehensive integrated village development including health and family planning have grown in terms of the villages covered and number of activities and programmes undertaken. An integrated development programme was implemented in 105 villages, between 1975 and 1979. An evaluation of the implementation of this programme was done by the Agricultural Finance Corporation Ltd., Bombay, in 1978-79. Out of these 105 villages, in 5 villages all the families and in 100 villages about 10 to 15 families per village were covered under the economic programmes. Social educational health and family planning programmes were meant for whole villages. The evaluation (Jan. 1979) of the

integrated development programme has revealed that the community has changed its opinion (about 90%) in favour of the small family (Table I). But the practice of family planning lagged behind. However, while in 1974-75 baseline survey (in 100 villages), only 10 per cent of the respondents practiced family planning in 1979, out of the same sample 9·65 per cent had adopted sterilization, 19·93 per cent were using self control and 24·4 per cent were using safe period methods for family planning (Table II).

It is evident from the above findings that even a tribal and backward rural community can be made to realize the significance of family planning and can also be motivated for the practice of contraception. What is required is a patient and sympathetic attitude on the part of project leaders towards the community and the eligible couples.

The gap between awareness and the practice of the family planning requires further analysis and understanding of the problem. A few points which need consideration while assessing the progress of family planning acceptance are; (*i*) effecting a reform in the life style depends not only on the will and personality of the individual, but also on various other factors influencing the social life of the individual; (*ii*) family planning practice requires a unified will and action on the part of two individuals (the couple); (*iii*) sexual relationship of a couple is much more than a simple mechanism of producing children. Any forced control on this relationship is likely to have adverse effect on the personality of the individual as well as the happiness of the family; (*iv*) though there have been great efforts to find inexpensive practical and safe methods for family planning, yet there still exists the need for further research and (*v*) planned parenthood envisages family planning practice at an age where irreversible methods of family planning are of limited value. The reversible methods of contraception involve trial and error on the part of the couple.

Table I. Acceptance of small family norm

Particulars	Percentage of respondents	
	1974-75	1978-79
100 village plan area	27·18	91·48
5 village plan area	14·42	85·58

The majority of the poeple in the Sonpar area—(the field of activity of Banwasi Seva Ashram) are tribals and backward communities. In the culture of these communities, there are a few practices which influence the age at marriage and family planning practice. A close association with the nature and the freedom of sex in the society makes an adolescent indulge in sex. Therefore, adolescent marriage is the usual practice in the area. This increases the effective reproductive period and at the same time poses a problem in introducing family planning practice. Adolescents take time to develop self control and self confidence for facing the problems of life and an commitment to the idea of planned parenthood. The situation gets further complicated as the adolescents are left to themselves to face the life's problems and get no moral support and guidance from the elders.

Table II. Knowledge, practice and experience of family planning*

Particulars	Methods (percentage of respondents)				
	Self control	Safe period	Operation	Loop	Pill
Knowledge :					
100 village plan area	39·06	37·46	69·71	12·70	16·40
5 village plan area	33·65	78·85	68·27	—	4·80
Practice :					
100 village plan area	19·93	24·11	9·63	—	—
5 village plan area	28·85	78·75	4·80	—	—
Experience satisfaction :					
100 village plan area	12·86	24·11	8·68	—	—
5 village plan area	21·15	66·35	3·85	—	—
Dissatisfaction :					
100 village plan area	7·07	—	0·96	—	—
5 village plan area	7·69	12·50	0·95	—	—

*Condom method missed inclusion in the survey form

In the Sonpar area nuclear family system appears to have emerged out of the compulsions of poverty. Here, the old people are seen living on their own, helped and supported to some extent by the community.

The other factor in the culture is easy divorce and good chances of remarriage. This has influence on the acceptance of permanent methods of family planning by the community. It is for this reason that family planning operations are often blamed for social consequences.

The people of the area are not ignorant about the possibility of and the desirability of the birth control. An old man had a complaint against the younger generation. According to him young people were not caring to space the children. Enquiries revealed that the people practiced periodical abstinence, abortions *etc.* as means of controlling the size of the family and used indigenous medicines for the control of fertility. In spite of the practice of family planning people believed that once born the child was a God's gift. Thus, a villager had no unwanted child but a 'gift of God' to care for.

The social situation in the area has been changing over the past years. The development efforts have focussed attention on economic growth and pleasures. The medical care facility has reduced the morbility and mortality. Unemployment and poverty has caused seasonal

migration. But at the same time new traditions for building the moral aspect of life are yet to replace the old dying traditions. This transition in the culture is the factor responsible for the time lag in acceptance of family planning and its practice. The transition is actually a period when an individual and the community is building its commitment to the new ideas, watching, the results of those few who have adopted the new ideas and practices and is making an effort to dissolve its own apprehensions regarding the new values in life. The same holds true for new family planning norms.

The new family planning methods have certain advantages and disadvantages. Most of the reversible methods offered require money and their availability is conditioned by nearness of the market place and or the facility for medical care. Another conditioning factor is the regularity and continuity in supplies. Further, the methods like loop and pills *etc.* are not so safe from medical point of view as well. As against the new family planning appliances the old methods like self control (withdrawal) and safe period do not require money, are not affected by market facility and supply position and require no medical supervision.

Actually every family planning method has some positive and some negative points. A couple often tries more than one method. What appears to be of significance from the point of view of the promotion of family planning practice is the development of a commitment for planned paranthood in the society and the education of the couples in family planning methods at the right time.

Family planning education has its own difficulties. It is a topic where an educator and the listener both find difficulty in communication. It is important for an educator to get over his own reservations and develop an understanding of the human behaviour and the culture of the area, so that he can introduce the topic in right perspective and guide the couple. Apart from the specific education and guidance of the couples a dialogue on the topic of planned parenthood needs to be introduced in the community, so that it is absorbed into the local culture.

Planned parenthood achieves much more than the population control. Parenthood or in other words *Grihastha Ashram* also takes care of the various functions of a welfare state, keeps a continuity in the knowhow gained on various aspects of life and contributes to the strength of the community and to the culture of the society. But today 'planned parenthood' has come to mean limitation of the size of the family. Hence the different family planning programmes are evaluated in terms of the control of birth rates in the community. It needs to be remembered that the thought behind the promotion of small family norm in the community is not population control but happiness and harmony in the society. Happiness in life depends on the development of the balanced personality and the development of a social situation where material welfare is available to the individuals along with dignity and respect.

Today the happiness in life is being equated with the accumulation of luxury goods and enjoyment in life with no concern for the society and the nature. The

development is identified with accumulation of wealth, high rates of consumption, less use of physical labour and dependance on a centralized system of production for the basic consumption needs and amenities in life. In the more urbanized and affluent communities acceptance of small family norm is an outcome of the concept of the growth of the individual, economic freedom for women and free sex. On the other hand, these trends in development and the new concept of happiness has increased stress and strain in life leading to disintegration of the family and the concept of individual liberty is questioning the feasibility of 'parenthood' as such.

Therefore, any undue haste in propagation of family planning practices for increasing the standard of living, without an evaluation and orientation of the present concepts of happiness, development and individual liberty, is likely to encourage individualistic and selfish attitudes. Such attitudes may prove helpful to curb the population growth, but at the same time may be seriously undermine the 'parenthood' as such and the 'happiness' of the individual, the family and the community.

Appropriate Technology for Primary Health Care, 1981 pp 163-166

Profile of an ideal contraceptive

S. Choudhary and L.M. Nath

Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi

Restriction of family size by family welfare planning has been the official policy of our country for the last many years. While considerable gains have been made in some areas and even in some states, the overall picture is far from reassuring.

Even now, the national birth rate statistics hover around the 34/1000 mark and in the Ballabhgarh block, for example, though the birth rate has fallen by 13 points per thousand in the last 12 years, it is still distressingly high, specially when we see it in conjunction with the overall crude death rate of around 8·5 per thousand population per year in that area.

We in India have proudly claimed that we are following the 'cafeteria' approach in which we offer a wide variety of contraceptive devise and the consumer can make an enlightened choice. But is there a real choice? A cafeteria full of a variety of meat dishes and one vegetable does not offer a choice to a vegetarian. Perhaps the choice of contraceptives available to the average village couple is either non-existant or very restricted indeed.

A close look at the choice of technologies available to our hypothetical 'average' village couple from the socio-cultural point of view reveals how truely restricted the choice is—specially if the intelligent couples' decision is tempered by their knowledge–instinctive or reasoned—of the prevailing infant mortality and toddler mortality rates, which mitigates their opting for irreversible procedures.

The question was raised whether we scientists are not being overly chauvenistic in being sublimely unaware of cultural realities and expecting the villagers to share our enthusiasm for our latest brain-child. We therefore, let the villagers indicate the characteristics of their concept of a good contraceptive and then perhaps scientists can tailor a device to suit the consumers' requirements.

This present preliminary report is based on an attempt to ascertain the villagers requirements. 530 individuals were interviewed based on a pre-tested questionaire. There were 245 females and 285 male respondents, all residents of a rural Haryana community in the Ballabhgarh Rural Health Service project of the All India Institute of Medical Sciences.

Table I shows the awareness of these individuals to the various contraceptive techniques. It will be noted that almost every individual quoted abstinence as a method. Knowledge about the rhythm method, condom and sterilization was

also almost universal. About 73 per cent of the sample knew about the loop. The pill was known to only 25 per cent of the individuals.

Table II shows the family planning methods used by the sexes. It will be seen that as can be expected the males and females gave almost identical answers. It is not surprising to note that about a 30 per cent of the population depended upon surgical sterilization as this area has the facility provided by the Ballabhgarh Project of the AIIMS.

As expected the condom is popular. It is noteworthy that almost 34 per cent of the sample had never used any method of contraception.

Table III shows the importance accorded to spacing. It may be noted that women accorded greater priority to spacing than males but it is encouraging to note that in both groups about 95 per cent accorded importance to spacing.

Table IV highlights the choice of the individuals of a contraceptive

Table I. Knowledge of family planning method by sex

Method	Male	Female	Total
Abstinence	99·3	98·8	99·1
Rhythm	84·9	80·0	82·6
Nirodh	94·4	89·4	92·1
Pills	25·3	23·3	24·3
Loop	74·0	71·4	72·8
Sterilization	98·6	97·6	98·1
Indigenous methods	12·3	5·3	9·1
Abortion	22·1	11·4	17·2
Any others (withdrawl)	3·9	0·4	2·5

Table II. Family planning methods used by sex

Method	Male	Female	Total
Abstinence	1·4	0·4	0·9
Rhythm	6·7	7·3	7·0
Nirodh	24·6	28·6	26·4
Pills	0·0	0·0	0·0
Loop	0·7	0·8	0·8
Sterilization	31·2	29·4	30·4
Indigenous methods	0·4	0·4	0·4
Abortion	0·4	0·0	0·2
Any other (withdrawl)	34·4	33·1	33·6
Sample size	285	245	530

Table III. Importance of spacing by sex of respondent in percentage

Importance	Male	Female	Total
Very important	42·8	53·5	47·7
Important	53·0	41·2	47·5
Not so important	3·5	3·3	3·4
Unimportant	0·7	2·0	1·3
Sample size	285	245	530

Table IV. Preference for existing methods by sex

Methods preferred	Male	Female	Total
Abstinence	2·5	0·4	1·5
Rhythm	5·0	1·6	3·4
Nirodh	4·2	2·9	3·6
Pills	0·4	0·0	0·2
Loop	0·7	0·4	0·6
Sterilization	47·7	53·1	50·2
Indigenous methods	0·4	0·4	0·4
Abortion	0·4	0·0	0·2
None	38·9	41·0	40·0
Sample size	285	245	530

from amongst those available. It may be noted that 5 per cent of the people said that of those available, sterilization was the best option. It is noteworthy that though 26 per cent were nirodh users, only 3·6 per cent approved of this method. Equally noteworthy is the fact that though they knew about most methods, almost no one vouched for the desirability of any of the methods other than sterilization and 40 per cent of men and women flatly stated that there was no desirable method —in spite of 95 per cent people agreeing on the importance of spacing.

If people are in favour of spacing and family planning, and almost all knew of the available methods yet 40 per cent said that they accepted none of the methods as desirable, it seems to be clear that medical scientists have to come up with a contraceptive device—which the public seems to demand that is acceptable to the people.

Table V shows that almost 73 per cent of both men and women seemed to think that the contraceptive device should be such that it applies to women.

Table VI shows that the preferred duration of action is overwhelmingly in favour of two or preferably three years. Only 18 per cent felt that a permanent method was desirable.

Table VII indicates that over 86 per cent of men and women seemed to want an injectable device.

Table V. Preferred contraceptive user by sex

User's sex	Male	Female	Total
Male	28·3	26·5	27·7
Female	71·2	73·5	72·3
Sample size	285	245	530

Table VI. Desired duration of effect of an ideal contraceptive by sex

Duration	Male	Female	Total
Permanent	18·9	18·4	18·7
One day	0·4	1·6	0·9
One month	2·1	0·4	1·3
Six months	0·4	0·0	0·2
One year	4·6	1·2	0·3
Two years	19·6	24·9	22·1
Three or more years	42·8	50·2	46·2
Lasting till consciously removed	11·2	3·3	7·5
Sample size	285	245	530

Table VII. Preferred mode of use of contraceptive by sex

Mode of use	Male	Female	Total
Applied locally	1·8	1·6	18·7
Oral medication	4·2	2·9	3·6
Injected	84·9	87·3	6·0
Surgical	9·1	8·2	8·7
Sample size	285	245	530

Table VIII. Effect on mensturation of ideal contraceptive—males (n=285)

Blood loss	Unacceptable	Don't know	Desirable
No bleeding	19·3	70·9	9·8
Reduced bleeding	4·6	70·5	24·9
Increased bleeding	23·5	75·4	1·1
Spotting	15·8	81·8	2·4

Table VIII shows, most men were not concerned about the effect on the menstrual flow.

However women seemed quite clear (Table IX) that any technology which cuts out bleeding was unacceptable and yet they seemed equally clear that reduced blood loss was a desirable feature.

To summerise it seems from our work that though contraception, at least for spacing, is desired by the rural population and though knowledge about contraceptive devices is present in the population, 40 per cent of the couples reject all available methods. The people demand an injectable device for the females which is effective for two or three years and which reduces but does not stop the menstrual flow.

Table IX. Effect on mensturation of ideal contraceptive—females (n=245)

Blood loss	Unacceptable	Don't know	Desirable
No bleeding	57·6	23·3	19·1
Reduced bleeding	26·9	23·7	49·4
Increased bleeding	73·9	25·7	0·4
Spotting	71·8	26·1	2·1

Appropriate Technology for Primary Health Care, 1981 pp 167-168

Culturally acceptable contraceptives

Suman Mehta

Institute for Research in Reproduction, Bombay

Pure water, a sanitary environment and nutritious food have long been recognised as pre-requisites of good health. In recent decades medical studies have revealed another essential component of health strategies—the family planning. Uncontrolled fertility directly threatens the health of mother and infant and may undermine the health of other family members. Today no health care programme can be considered complete unless it offers ready access to appropriate family planning measures for all potential parents.

Social context has great bearing on fertility control. The success of the family planning programme will depend on how well policy makers grasp the significance of social factors and how skilfully are they utilized.

Looking back to the history of our country it is evident that community has been using various methods like abstinence (specially in postpartum period), douches, coitus interruptus, abortion and even infanticide to avoid pregnancy and unwanted babies.

So our culture does accept the use of contraceptives. Why then are we not making a significant progress in use of modern methods which are more effective? Is it because they are culturally not acceptable? Cultural specifications are essential in making the diffusion of the innovations more rapid and widespread.

In the 1960's, 'Lippes loop' failed after an excellent take off and the main reason for that was irregularity in menstrual pattern. Any change in menstrual pattern is unacceptable to Indian women. During the period the women is bleeding, she cannot participate in household, religious and social activities. Amenorrhea, a side effect of some contraceptives is also not acceptable.

Improved technology—(improved that is, in terms of increasing its compatibility with life's circumstances and preferences of potential users), seems unlikely by itself, to lead to change from non-use to use—certainly not by people who see substantial advantage in having more children. But increasing the socio-cultural fit of fertility regulatory methods is clearly one part of the equation that can result in providing couples with real choices in determining their reproductive behaviour.

Giving a choice of contraceptives to choose from not only provides good salesmanship but also gives the user a sense of personal control over his/her fertility and choice born out of variety encourages wide spread community involvement—different community personnel encouraging different methods.

Administrators have been laying varying emphasis on different methods over the period and this has definitely modified the acceptance. In the last decade the main method was IUD. Currently we are doing well in the contraceptive phenomenon of 1970's—Voluntary sterilization. This is practically the only method being propogated and practiced in rural areas. Why is this so? Why are we emphasizing and keeping targets for sterilizations only?

Women who bear children too often, too close together put themselves and their children in danger. Yet, even with this knowledge of the hazards, spacing methods are completely lacking in practice.

A lesson needs to be learnt from past experience. Collapse of the programme due to full emphasis on one method should not be repeated again. There should be a balanced approach, and spacing methods, specially IUD must be given its due importance.

In the past and in some places even now people obtain contraceptives only from clinics after enduring considerable inconvenience and humiliation. Clinics are reached only by those who live within few miles of the facility. Available statistics suggest that primary health centres are underutilized and private medical practitioners flourish in those areas. In so far as the family planning is concerned women do not want to be seen visiting the clinic for that purpose.

Paraprofessionals are being utilized to varying degrees in our primary health centres for family planning services. Female workers distribute pills. In some districts they have the training to insert IUCDS.

These and some other grass root techniques have improved the acceptance and use of FP methods in other countries but they have not done much for us. Targets are laid for sterilization and performance has exceeded the targets (consistent in other years). The doctors from some of the primary health centres informed us that the paramedical workers do not know how to insert IUDs. Since training is lacking and targets are now there—so IUDs or oral contraceptives are not talked about at all at the time of motivation.

In Uttar Pradesh LHVs have been trained for insertion of IUDs—but at some PHCs which I visited, they had not inserted a single IUD in a period of 3-6 months. This was again due to apathy among workers at all levels.

It is necessary to make the community aware about the advantages of spacing children. The need for spacing methods to the providers of these services at all levels has to be emphasised. Targets for all methods should be laid.

Training paraprofessionals for IUD insertion is necessary. Women will be culturally more acceptable. In the light of shortage of doctors this strategy is very important. Involvement of private medical practitioners in the area, can play a significant role since community turns to them often and has high regard for them.

Appropriate Technology for Primary Health Care, 1981 pp 169-173

Role of health education in the field of family planning

B.C. Ghosal

Central Health Education Bureau, New Delhi

Health education must form an integral part of our health programmes if they are to succeed. The Bhore Committee Report (1946) has emphasised on 'broad participation of the people' in the health services of the nation. And the essence of health education is the community participation in the health programmes which are meant for it.

Definition : 'Health education' is a simple concept but understood differently by the planners, the administrators, the practitioners and the laymen. 'Health education' like general education, is concerned with changes in knowledge, feelings and behaviour of people by their own efforts. In its most usual form it concentrates on developing such health practices as are believed to bring about the best possible state of well-being'. This is the accepted definition given by World Health Organisation. This is the gist of the health education process.

Health education is based on the philosophy that : human beings have the inherent desire and need for dignity, self reliance, freedom and moral responsibility. They possess intelligence, can learn and understand what is good for them, are capable of weighing the pros and cons of problems of life and making rational decisions and taking suitable actions to tackle or solve these problems. Human beings have ability to acquire new attitudes, skills and modes of behaviours at all ages. Education produces changes in human behaviour, changes in what people know, in what they think, in what they can do and in what they actually do. Health education helps people to make right decisions on health matters by providing experiences to develop understanding and insight which facilitates individual and community action.

There are three clear cut objectives of health education : (*i*) to improve the knowledge of the people as individuals and members of groups so that they make health a valued community asset, (*ii*) to help people develop the knowledge and skills to undertake activities which will enable them to help themselves in achieving optimal health: and (*iii*) to help people to understand the nature and purpose of health services and facilities provided for their benefit so that they may be able to make the best use of such services and facilities.

Role of health education in family welfare programme is vital.

In view of the alarming rise in the growth rate of our population we require

to intensify our efforts to bring change in the knowledge, beliefs and reproductive behaviour of the people :

(*i*) Acceptance of small family-size norm;

(*ii*) Group support for change; and

(*iii*) Practice of FP methods.

The entire adoption and diffusion process can be brought about by integrating health education with different programmes. If we review the facts related to the mass acceptance of the family planning programmes, we find that majority of people still have faith in large families due to many reasons. Though there has been a considerable decline in the infant mortality rate and maternal mortality rate, people continue to have faith in large family norm. Even at the time of marriage, the blessing is '*Supt Putro Bhav*' meaning thereby that 'May God bless you with seven sons. The universal desire to have at least one son in the family is another difficult social barrier which prevents people in accepting family planning at the right time. Besides, our country presents cultural, religious and social diversities.

The researches conducted in various parts of the country from time to time have shown that the fertility rate is higher among people with lower rate of literacy, low per capita income and living in poverty. It has also been observed that early marriage which is a common practice in rural India, has been one of the significant factors responsible for a high fertility rate.

India's population which was 238 million in 1901 increased to 279 million in 1931, 548 million in 1971 and today it is 683 million. The increase in growth rate is due to fall in death rate and not due to increase in birth rate. Death rate has declined by nearly 50 per cent during the past 70 years. According to the Office of the Registrar General of India, the growth rate which was estimated to be 2·04 per cent during 1971-75 will decline to 2 per cent in 1976-80.

It is estimated that the death rate might decline still further and reach the low level of 10 per 1,000 population by 1990 or so. Birth rate would, therefore, be the crucial factor in determining the future growth of India's population.

Government of India was the first among the few Governments in the world to adopt family planning as a national policy under the First Five Year Plan period which started in 1952 with the aim of providing family planning services through hospitals, clinics and primary health centres. In the subsequent period of 15 years, it was realised that the narrow clinical approach of the previous decade planned to be ineffective and therefore, shift was made to extension approach in 1962.

On the basis of the research findings and experiences the programme of family planning continued expanding with necessary changes and modifications in terms of the services, system of approach and incentives *etc.* and ultimately it has been made an integral part of the National health programmes and other welfare programmes. It is now a family welfare programme aiming to improve the health and qualitative aspects of family in terms of its economic and social welfare too.

To prove the reliability and validity of the health education the following examples are being cited in its support. These

examples are based on the practical experience of the authority. Most of the examples are from the Rural Field Study and Demonstration Area of CHEB, Pataudi, in District Gurgaon in Haryana. Pataudi Primary Health Centre is 62 kilometer away from Central Health Education Bureau.

At primary health centre in Pataudi in 1969, 123 villages with a population of 97,452 was studied. At that time highest priority was given to the national family planning programme. The PHC was not able to achieve even 33 per cent of the targets as far as sterilization (vasectomy and tubectomy) was concerned. The urgent problem of the PHC was how to achieve the targets. It was observed that the staff of PHC was not working systematically and there was little health education in their activities. A detailed plan of operation was developed in consultation with PHC staff for health education cum service programme for family planning. The staff of PHC was oriented in the health education techniques and methodology.

The results of the health education activities were reflected in the increasing sterilization—the sure criterion for family limitation. The results of the health education were very encouraging. The following table gives the achievement of family planning method-wise during 1968-69, 1969-70, 1970-71 and 1971-72.

Table. The year-wise achievement in family planning method-wise

Year	Sterilization	IUD
1968-69	68	196
1969-70	138	195
1970-71	325	268
1971-72	654	326

The impact of the health education is clear. Since the induction of health education in the latter part of the year 1970 the method-wise achievement started increasing gradually. During 1970-71 PHC were able to achieve 173 per cent of the sterilization and 99·2 per cent of IUD targets and during 1971-72 the achievement of targets were to the tune of 260 per cent for sterilization and 83 per cent for IUD. CHEB was given a prize for its extra ordinary contribution towards health education for 1970-71 and again individual prizes to its staff in 1971-72 for their outstanding contribution for health education work.

Systematic health education with additional provision of elementry (selected) medicines for minor ailment was a study in 1970-72. This project was undertaken by CHEB in collaboration of PHC staff to achieve the increased acceptance of family planning. Twenty villages with a population 14,618 were studied. The field worker was to work in this area systematically completing all the steps which were enumerated in health education. In addition to these he was to treat the patient with minor ailments free of charge. The population of approximate 15,000 was divided into two phages, intensive and extensive. He worked in a population of 5,000 intensively in the beginning spending 14 days in a month in this area and only 6 days in the extensive area. After the required number of eligible couples accepted one or the other method of family planning it was put in to post-intensive phase and another area of 5000 from extensive area was taken for intensive activities.

Out of the total eligible couples (465) in the post intensive area 30 per cent had

accepted one or the other method of family planning. As all the cases were from couples having three and more than three children therefore about 53 per cent of these couples had accepted one or the other method of family planning.

In the intensive area only 136 eligible couples of the total 715 had accepted one or the other method of family planning. But more than half the eligible couples having three and more than three children had accepted sterilization.

Several suggestions are made. The state level workshops and conferences may be held involving the state level administrators in the field of health, education, social welfare, revenue and industries *etc*. These workshops may be organised by the Central Training Institute with active involvement of CHEB with the purpose of reviewing the ongoing family welfare programme in the states and suggest measures for better results. At the District level the training of teachers, revenue staff and staff of other sister institution should be held to promote involvement of various category of personnel in the programme. The District Health Committees should see that after the training, the staff take active interest in promoting community acceptance of the programme. Training in family welfare programme may be integrated in the existing training curricula of teachers training, panchayat orientation, training in nutrition education and training of the revenue staff. The idea is to make family planning an integral part of any training course held in the country for training people for any type of work. The staff responsible to train these personnel should be trained at CHEB in the Staff College Training Courses.

Follow up workshops may be organised by the State Health Education Bureau from time to time to review the progress made with regard to the participation of personnel in disseminating information about the family welfare programmes and helping people to accept the idea. Unless the various departments and institutions are involved in the existing family welfare programme no success can be expected. The present day family welfare programme is on purely voluntary basis and it has in fact always been on voluntary basis. It is essential that people should accept it as a way of life and this is possible only when we involve every government and voluntary body in the programme and make sincere efforts in seeking public cooperation in increasing acceptance of suggested measures of family planning. A Co-ordination Committee need to be constituted with officers from AIR, TV, DAVP, Press and Song and Drama Division of the Ministry of Information and Broadcasting and consultant from Central Health Education Bureau to strengthen the educational programmes of these Departments.

At the Block level special courses from time to time be organised for MPWs and CHVs under the guidance of district medical officer and district mass extension education officers. Their reports of achievements be reviewed and incentives or dis-incentives be given for their work performance or target achievements.

The population education programme must be introduced in the formal and non-formal education programme of the Ministry of Education and Ministry of Social Welfare. There is great need to

strengthen health education component in the syllabii for the under-graduate medical courses in all system of medicines. The CHEB can play an advisory role in strengthening health education component of the different syllabii for the medical colleges in India. The training curricula of college and schools of nursing and health visitors and that of ANMs need to be reviewed and health education component be strengthened. The SHEBs and Regional Health and Family Welfare Training Centres may be made responsible to take up this activity and inform CHEB about their progress in this direction.

Importance and role of health education needs no emphasis as far as promotion of the family welfare programme is concerned. Language and terminology of health education is well understood by the majority of medical and health personnel. The discipline is based on sound and tested principles of administration, social work, community organization, public health, behavioural and social science and education *etc.* A proper and systematic application of these principles and effective supervision can help very effectively in the promotion of family welfare as an integral part of health services.

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Potable water supply and management in primary health care

A. Raman and V. Haraprasad

NEERI Zonal Laboratory, Delhi

Potable water supply is an essential requirement for the improvement of public health. It has, therefore, an important part to play in primary health care for rural communities. The paper examines the country's achievements and its future targets in regard to potable rural water supply. It also discusses the steps necessary for achieving full health benefits from the rural water supply programme.

Potable water supply defined

Potable or protected water supply may be defined as the supply for domestic uses of water that is acceptable in regard to physical and chemical quality, is free of objectionable micro-organisms and is also palatable. In water supply evaluation phraseology, potable water supply is also termed as improved water supply (meaning an improvement over the traditional supply), safe water supply and water supply intervention.

Potable rural water supply may be of low level technology consisting of sanitary improvements to an existing village well or provision of tube wells with hand pumps. Or else, it may be a more advanced work consisting of a piped system with or without treatment works and with standpipes only, or with both standpipes and housetaps.

Public health importance of potable water supply

The public health importance of potable water supply lies in its potential for the elimination or reduction of certain diseases linked to water supply. One category of diseases which potable water supply can influence are those which are based on unsatisfactory water (water-based). A second category of diseases are those which can be transmitted through drinking water (water-borne). Yet another category of diseases are those which can spread because of lack of water for personal hygiene (water-washed or water-preventable).

Control of water-based diseases : Water-based diseases may be caused by excess of certain chemicals in water such as fluorides or nitrates. We are considering only the naturally occurring constituents of water and not toxic chemicals arising from industrialisation. It is known that many areas in Tamil Nadu, Andhra Pradesh, Rajasthan and Haryana have excess fluorides in the ground water. Obviously, the provision of a chemically safe water supply should be able to eliminate the

diseases caused by objectionable chemicals in traditional village sources.

Water-based diseases may be caused also by certain micro-organisms which are obliged to spend part of their life cycle in anaquatic host. A typical example is the guinea-worm disease. The risk from the disease arises where traditional sources are step-wells and ponds. It is reported that over 3000 villages in the country (1972 reckoning) with a total population of 1·84 million are exposed to the disease[1].

Potable water supply should well be able to eliminate guinea-worm disease. A simple intervention such as provision of draw wells may be sufficient for the purpose. In an All India Rural Water Supply Evaluation Project now being carried out by NEERI[2], it was found in 4 villages in Haryana that guinea-worm disease had been prevalent there about 4-5 decades back. In fact, the older generation of villagers would acknowledge only this disease as being water related. The disease had disappeared from the villages after the provision of draw wells in place of the traditional village pond sources and the younger generation hardly knew anything about this disease[3].

Effect on water-borne diseases : Diseases which could spread through the water-borne mechanism consist mainly of faecal-oral diseases, particularly cholera, typhoid, infectious hepatitis, *etc.* However, these diseases may spread through many other mechanisms also. The risk of their water-borne transmission arises when water sources are unprotected and subject to faecal pollution. The water-borne mechanism would normally result in epidemic outbreaks.

Several cases starting with the Broad Street Cholera Epidemic 1854 have demonstrated how unsafe water supplies have resulted in epidemics of water-borne diseases. Some recent cases from India pertain to cholera[4] and infectious hepatitis[5]. Investigation of the cholera epidemic in Assam (1964) showed how river sources caused downstream spread of the disease. Also, investigation of the Maharashtra (1964) and Gujarat (1964) cholera epidemics revealed how village wells and ponds spread the disease within the community, once the infection entered from outside[4].

The faecal-oral diseases constitute a major health problem in all developing countries. It has been estimated that half of the global infant mortality is due to these diseases[6]. It has further been estimated that about 400 million people suffer from these diseases at a time and 25,000 die from them each day[7]. Most of the morbidity and mortality from these diseases have been in developing countries.

Some interesting data has come from Bangladesh in regard to the prevalence there of faecal-oral diseases. It has been estimated that 60 per cent of the country population suffers from some sort of water-related disease including cholera, typhoid and parasitic infections. Diarrhoea is the major health problem, every child getting it thrice a year and every adult atleast once a year. The disease is caused primarily by polluted drinking water[8].

In India, data on the incidence of water-borne diseases have been rather hard to come by. Cholera has been registering a sharp decline in the country with

only about 5000 cases having been registered in 1979[9]. But, diarrhoeal diseases as a whole form a major menace, being the second most important health problem[10]. According to a 1972 survey, 34,000 villages with a total population of 24·2 million are subject to the risk of water-borne diseases in the country[1].

Potable water supply should be able to reduce the risk of a faecal-oral diseases by eliminating water-borne transmission. The earliest evidence in this regard is about the control of cholera and to a great extent of typhoid in Great Britain in the nineteenth century with the improvement in water supplies. As recent evidence, we have the Orissa (1964) cholera epidemic in which people with protected water sources suffered the least attacks[4]. Similar evidence has also come from Mulange, Malawi[11].

Reduction of water-washed diseases : Many infectious diseases are spread through lack of personal hygiene resulting primarily from shortage of water. All the faecal-oral diseases, in addition to being potentially water-borne are also water-washed. In fact, dysentery is reported to be transmitted more through this factor than through contaminated water. Also, the faecal-oral parasitic diseases, *Ascariasis* and *Trichiuriasis* are reported to be rarely water-borne and to spread predominantly through the lack of personal hygiene. Certain skin and eye-diseases such as scabies, fungus infections of the skin and trachoma also spread due to lack of personal hygiene[12].

Provision of water in quantities sufficient not only for drinking and cooking but also for bathing, personal ablutions, washing of clothes, *etc.* should be able to reduce the risk of spread of water-washed diseases. Studies in USA have shown how the incidence of dysentery in children varied dramatically with the distance from the houses to the water supply and sanitation facilities[13]. Cairncross *et al.*, have reported supporting data in regard to reduction of trachoma with improvement in water quantity[12].

Role of potable water supply in primary health care

Potable water supply should be an integral part of primary health care. The 1978 conference on primary health care held at Alma-Ata, USSR has well acknowledged the role of potable water supply. The conference has stated : "Potable water supply reduces mortality and morbidity, particularly amongst infants and children and helps to make life easier for women. Primary health care should include an adequate supply of safe water along with basic sanitation... Countrywide plans are required to bring potable water supplies to the majority of the people in the shortest possible time... The health sector of primary health care should promote investment in water supply and sanitation"[14].

Potable rural water supply programme in India

In India, potable water supply for rural areas had started getting attention only from the fifties. Initially, the sector was being given only limited importance; but, with successive Five Year Plans, the attention to the sector has been increasing.

The investment made in the sector so far and the coverage achieved have been shown in the Table.

Table. Potable rural water supply programme in India*

	Investment Rs. crores	Population served cumulative millions	Per cent of total rural population served
First Plan 1951-56	3	6	2
Second Plan 1956-61	30	16	4
Third Plan 1961-66	18·6	24	6
1966-69		Not available	
Fourth Plan 1969-74	208	30	6
Fifth Plan 1974-79	552·1	Not available	10·5
1979-80	209·7	161	31

*From Reference 15

To sum up, the total investment on rural water supply so far has been above Rs. 1000 crores and the coverage effected has been about 31 per cent of the total rural population.

From now on, the investment will increase considerably in view of the country's committment to the objective of "clean water for all by 1990", set by the United Nations in its International Decade (1980-90) Plan for Water Supply and Sanitation. Thus, an investment of over Rs. 2000 crores is expected in the Sixth Plan (1980-85) and over Rs. 5000 crores in the Seventh Plan (1985-90). The Sixth Plan will cover all villages in the country faced with water scarcity and other water problems. These number about 200,000. The Seventh Plan is expected to cover all the remaining rural population in the country.

Objectives of the country programme

In the rural water supply programme in the country, the main objective was public health improvement initially. Thus, up to about 1965, the priority was first to serve villages with specific health problems such as cholera and guinea worm disease and only next to serve water scarcity areas.

Since 1965, however, there has been a shift of the primary objective of the programme to meet the minimum water needs of the people in water scarcity and water difficult areas. The present order of priorities are[1]:

(*i*) communities which do not have an assured source of drinking water within 1·6 km or within a depth of 15 m and in the case of hilly regions within a vertical height of 100 m,

(*ii*) communities where cholera, guinea-worm disease, *etc.* are endemic and

(*iii*) communities where there is generally an excess of chloride, fluoride or iron content in the water.

The present emphasis shown on water scarcity recognises the fact that in many

rural communities in the country, obtaining even a minimum quantity of water is a major problem. The situation is in sharp contrast to that in some other developing countries where water is readily available but is often polluted and the need for improved supply, therefore, arises from health considerations.

Need for special efforts for realising health benefits

A significant point is arising from the above that most of the sectoral investment has been and will continue to be for meeting the water scarcity problem and not specifically for promoting public health. No doubt, Plan documents have declared that safe drinking water has a direct bearing on the health of the people and that no other measure can pay as much in health as the provision of safe drinking water[16]. But, health benefits may not flow automatically from potable water supply programmes. In fact, many recent 'Health improvement studies' have shown an absence of demonstrable health benefits from improved water supplies. Thus, there was no difference in the water-health relationship in Lesotho for villages with and without improved supply. So also, in Bangladesh, users of tube wells did not have lesser incidence of cholera than the non-users[12]. In India itself, in the NEERI project already referred to, it was either "difficult to draw any significant conclusions about positive health impact from the water supply improvement" or "hard to believe that protected water supply had made any impact on the health of the community"[2].

Part of the inconclusive and negative findings in many health impact studies of rural water supplies may be due to the difficulties in the evaluation process itself, *e.g.*, in selecting proper control communities as pointed out by Cairncross *et al*[12]. However, the findings also show that potable water supplies may not yield health benefits as a matter of course. Special efforts may be necessary in the programme if it is to deliver the expected benefits. In this context, two questions arise : Why is it that the benefits are not realised ? And, how can we ensure realisation of all the potential benefits ?

Constraints in realising health benefits

The various health impact studies on rural water supply have helped to identify the constraints in realising health benefits from the programme. These may be grouped as neglect of basic sanitation as an allied requirement, technological deficiencies in water supply management and lack of proper community response to the water supply intervention.

Basic sanitation : Potable water supply without allied interventions may be able to control only strictly water-based diseases. It may not be able to control the much more important faecal-oral diseases effectively as these have other routes of transmission also. For effective control of these diseases, basic sanitation (meaning safe excreta disposal through sanitary latrines) is essential along with potable water supply.

Basic sanitation has so far been a neglected intervention in the rural environment in India. In the NEERI Rural Water Supply Evaluation Project already referred to, all but 5 out of the 30 survey villages with water supply did not have any latrine coverage and the 5 had only partial coverage. The predominant practice in the villages was open defecation[2].

Clearly, with such neglect of basic sanitation, potable water supply may not yield much health benefit.

Technological deficiencies : Recent studies have brought out several technological deficiencies in rural water supply programme inhibiting health impact. The deficiencies have been both in programme planning and management as discussed below.

Many rural water supplies in the country have been planned only for small per capita supplies, say as little as 25 lpcd. The intention has been to extend programme coverage by saving on the cost of individual installations. However, the policy has resulted in a situation where the water supply seldom suffices for personal hygiene. Such restricted supply cannot obviously control the water-washed mode of disease transmission forming a very important factor in the spread of many diseases.

The problem of inadequacy of water for personal hygiene has also arisen from another planning feature in which water is supplied only through street standpipes or through handpumps and sanitary wells. The efforts required in fetching water in these cases have hindered people from drawing adequate water even when available at the supply points.

Yet another planning feature acting against health benefits has been the neglect of palatability in source selection in many cases. As a result, the villagers have very often continued to use their traditional sources for drinking as they find them more tasty and use the new protected water only for other purposes[3]. Continued resort to traditional unprotected sources resulted also when new supplies were irregular subject to mechanical breakdowns or subject to failure at the source.

Defects in system design and in operation of protected supplies have adversely affected the bacteriological quality of the potable water supply itself in many cases[2]. Obviously, if protected community supplies are not actually free of pollution, they cannot yield positive health benefits and may even give a negative impact by generating water-borne epidemics. In Europe, for example, the Hamburg Cholera epidemic (1892) and the Croydon Typhoid outbreak (1937) were each spread by town water supply. In India, gastro-intestinal epidemics have been spread in Aurangabad[5], Bombay, Delhi *etc* through defective water supply systems.

Inadequate community response : However satisfactory a potable rural water supply may be, it cannot deliver health benefits unless the community uses the facility properly. Often, as already discussed, the community may not use the potable water for its intended purpose or else it may not use it adequately. Yet again, inadvertently, the community may despoil the water quality before use. There have been many reports of water pots being washed with mud and being cleaned inadequately, hands being dipped into the collection and storage vessels during collection and transport as well as during removing it for use, water being stored improperly in the houses, *etc.* Such practices result in contamination of the potable water which could lead to spread of diseases within the house-hold.

Suggestions for ensuring health benefits

(*i*) Provide sanitary latrines along with water supply when the water supply

intervention is intended to control specific health problems and promote sanitary latrines when the intervention is intended to meet the scarcity problems. It may be hoped that in this decade, there will be greater progress in latrine provision in the country than in the past, as sanitation is also an objective of the 'Decade programme'.

(*ii*) Provide water in adequate quantities to meet not only drinking needs but also requirements for bathing and washing. No blanket criteria can be laid down for per capita supply as the need will depend on climate and social and cultural habits. Probably, a minimum of 45 lpcd should always be provided.

(*iii*) Assure that potable supplies remain as palatable as the traditional village sources, if not better.

(*iv*) Wherever possible, protect the traditional water sources of villages against gross contamination so that no great hazards arise even if villagers do resort to them.

(*v*) Plan the water supply points in such manner that villagers do not cut down on water use because of difficulty in fetching water. House taps should be promoted.

(*vi*) Ensure regularity and reliability of the potable water supply by giving adequate consideration for these two factors both in design and maintenance.

(*vii*) Provide adequate measures in implementation stage to prevent problems such as water stagnation around standpipes and in the streets which may cause insect breeding.

(*viii*) Promote health education in the user communities with special reference to the water-health relationship so that the water supply is used to the best health advantage.

(*ix*) Encourage community participation.

Conclusion

In recent years there has been some sort of informal debate whether potable water supply is really a cost-effective method for promoting public health in rural communities. However, the debate may not be very pertinent in our context as the country programme in rural water supply is being mainly aimed at meeting water scarcity in the villages. The problem for us is how to derive maximum health benefits from the programme. Health benefits may not flow from potable water supplies automatically and special efforts are required in regard to programme planning and management and health education of the user communities.

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Community participation in environmental sanitation

Ram Das

Evaluation and Action Reseacrh,
A-28, Friends Colony, New Delhi

Appropriate Technological Models have been developed for supporting the environmental sanitation programme in this country by a number of governmental and voluntary research agencies. The main problem has been to find out ways and means to transfer the successful results of such researches to the people so that they could be motivated to accept them and be willing to adopt them as a part of their daily life. As in any sophisticated technology, both hardware and software are equally important for appropriate technology. It is through such efforts that the people can take full advantage of such findings and be able to manage the proven appropriate models with their own resources and in their own settings. Little success has been achieved on this front. Research is thus urgently needed on the softwares rather than on the hardwares of appropriate technology. The paper deals with both aspects of this problem, indicating briefly the successful experiences obtained from the active participation of some of communities in the environmental sanitation programme. Two basic items of environmental sanitation *i.e.* sanitary disposal of the human excreta and safe drinking water supply, particularly of the rural sector where four fifths of the population live, have been discussed in the paper.

As a result of researches, models which could be classified as appropriate, have been developed which suitably satisfy the criteria of appropriate technology and fit in the socio-economic fabric of the village communities. These are :

(1) The PRAI water seal latrine with lateral pits.

(2) Dug well water seal latrine (RCA Singur).

(3) Sanitary latrine (RCA Poonawali).

(4) National Environmental Engineering Research Institute's sanitary latrine (NEERI Type).

(5) *Sulab shochalaya*, Patna (for community use).

(6) Direct pit latrine, suitable for area with hard and rocky terrain (Kerala type).

The above mentioned models are suitable for the different parts of the country and people have accepted them where suitable extension work has been carried out by some agencies—Governmental or voluntary.

Advantages of appropriate models

The following advantages and specialities exist in the appropriate technological

models when properly installed and used by the village people.

(1) They are free from foul smell and fly nuisance.

(2) They are simple to construct with available skills at the village level.

(3) They require very little water to flush them and there is no splashing of water from them.

(4) They provide a source of rich organic manure which can be utilized in improving the fertility of the land.

(5) They prevent air pollution as the gases are usually absorbed in the soil.

(6) They prevent the incidence of intestinal infestation.

(7) They are available at low costs as compared to the sophisticated models which are costly and require high degree of technical skills in their installation.

(8) They provide the safest method of keeping the homes and village environments clean.

(9) They do not require the services of sweepers. They are not easily available to the villagers now as was the case under old customary system.

Problems of transfer of technology

A question can be posed whether there is an awareness among them about it and whether they are convinced about its efficacy and usefulness. These are the two vital points which need be attended to. Enquiries reveal that awareness about appropriate technology is grossly lacking among the rural communities. Health education efforts of the Public Health departments have hardly touched the fringe of the environmental sanitation problems in the countryside. Educational and other institutions in the rural areas are not fully utilized to create the necessary awareness among the local communities. The block agency which is concerned with the rural extension work is mainly engaged in agriculture and related activities. It has hardly paid any attention to the village sanitation problem and its solution. How could such an important programme be tackled effectively presents a serious challenge to the innovators, planners and implementors.

In brief, it can be stated that there is neither awareness nor urge among the rural people for accepting the newly developed appropriate models for the sanitary disposal of the human excreta. The end result has been that the problems of insanitation and pollution continue to grow unabated. Due to the growing pressure of population, the sanitary problems are assuming serious proportions.

The first and foremost need, therefore, is that awareness be created among the local communities so that an urge may be developed among them for accepting and installing appropriate technological models in their homes for the sanitary disposal of the human excreta. Some experiences are available which throw positive light as to how some village communities were involved in such projects.

Experiences from PRAI in the development of appropriate technological model

During early sixties, the Planning Research and Action Institute, Lucknow, was assigned the responsibility by the U.P. Govt to tackle the problems of the health hazards caused due to insanitary disposal of human excreta in the rural areas. A suitable model of latrine was

developed, which was quite cheap and could be fabricated and installed by the village masons easily.

Sixteen villages in Block Chinhat, near Lucknow were selected for intensive work. The work could not make any headway in beginning. An evaluation study revealed that the latrine model was quite suitable; but the approach to motivate the people to accept it was not effective. Mere discussions with the people did not yield the desired results. It was observed that adequate demonstrations in installing the latrine were not given and that the local people did not evince much of interest in it. Health education programmes did not precede such efforts. The possible health hazards to which the local population was exposed every year due to insanitary conditions were not fully explained. As a result of these findings, the strategy of implementation of the project was suitably modified. Three months were then exclusively devoted to health education and demonstration. A sample survey of the stools of the local population was carried out in consultation with the village leaders to show the extent of parasitic infestation. It was found that 71·4 per cent of the population was affected by diferent types of parasities like hookworms, threadworms, roundworms, tapeworms *etc.* After the initial phase of demonstration education and persuasion the work of installation of latrines was taken up by teams of trained village masons. Latrine-parts were supplied by the local Panchayat 'Udyog' on payment. Fifty per cent of about 3000 families living in 16 villages installed latrines in their homes within 2 years. Rest of the families could not be assisted due to dearth of space for installing latrines in or near their homes. This was an aspect on which there was need toc arry out further research work. Unfortunately, it could not be tackled under that project due to shortage of time.

Similar work was started in about 12 villages of Meerut Block where the village communities were economically better off. The incidence of parasitic infestation was found to be about 50 per cent as against 71·4 per cent in Chinhat Block. In about a year and half, 50 per cent of about 3000 families living in these villages installed latrines in their homes. Rest of the families either did not have any sites for putting up latrines or were not fully convinced about their efficacy. Due to the closure of the project, a solution to this vital problem could not be satisfactorily found out.

Results obtained

Subsequent tests of the target population, after a period of about 2 years indicated that the rate of intestinal infestation among the people having their own latrines had considerably gone down. It could not be totally eradicated as there were possible other sources of infestation which could not be checked.

Extension work in the State

With the availability of appropriate model, the work of extension of the programme was taken up in the extension development blocks by the local panchayats, Local Self Government Engineering and the Public Health departments. The training courses for the local masons in the fabrication of latrine parts were arranged. Supply of latrine moulds for

preparation of parts in different blocks was arranged by Panchayat 'Udyog' Chinhat which had specialised in their manufacture. This work received a set-back due to the non availability of cement at that time. Where district authorities arranged for the supply of cement, the work continued to progress well. The Panchayat Raj department is still continuing this programme. There are about 800 Panchayats which have 'Udyogs'. They manufacture latrine parts and arrange for the installation of latrines in the homes of the village people who pay their costs which range from Rs. 45 to Rs. 70 for the full set. The work is now progressing of its own but the drawback is that the departmental agencies pay hardly any attention to this vital work. Results are, therefore, not available as yet to find out the overall impact of this programme.

Appropriate models for supply of drinking water

Appropriate Models are available for the supply of drinking water which have been developed, as a result of considerable amount of research and experimentation carried out by different agencies in the country.

Hand pump tube wells : In the Northern region of the country, where underground water is available upto a depth of 25′ to 30′, handpump tubewells costing between Rs 200 to Rs 500 have been found to be effective models for the supply of safe drinking water to the rural communities. Individual handpump tubewells are installed by the people in the courtyards of their homes and thus the problem of avoiding pollution of water has been greatly solved. In homes where people are too poor to install handpump tubewells on their own, community tubewells can be installed with the help of local institutions. Mark II pump as developed in collaboration with UNICEF has been found to be quite suitable for the community use.

NEERI model for disinfecting well water : In areas where handpump tubewells cannot be easily installed and the source of water supply is from dug wells, NEERI has been able to develop a device through which well water can be chlorinated and made safe for drinking. This device remains effective for a few months. People have, however, not accepted this device on any appreciable scale on account of the factor of cost and the botheration of its frequent replacement.

Piped water supply scheme : Village piped water supply schemes have been tried for individual village as well as groups of villages in different parts of the country. Experience indicates that the village water supply schemes are, in many cases, quite viable. They can be maintained by the village communities and run effectively by them. In the State of Maharashtra, in particular, all the water supply schemes when completed are passed on to the village panchayats which manage them quite efficiently. This has been observed by the author while evaluating the district Ratnagiri village water supply schemes supported by FAO. In other states their management is retained by the government departments. Such schemes often do not function well. Village communities should be fully involved in the execution and maintenance of such schemes. People should realise from the very inception that these are their own projects and they have to maintain and run them to get the lasting benefits.

Available experience of community participation in water supply schemes

Experiences are available from Barabanki and Gorakhpur Water Supply Schemes in UP which were run in collaboration with local panchayats. They catered to the water supply needs of 5000 to 10,000 persons living in 5 to 10 villages in the two districts respectively. Details of the schemes and their operations are available from the Planning and Action Institute, Lucknow. Barabanki scheme had five components—water supply, installation of sanitary latrines, individual home water connections, stand posts for the poor people and health education. The village panchayat started 'Udyog' for the fabrication of latrine parts and provided services of trained masons to install latrines in individual homes. The whole scheme functioned very effectively.

Magnitude of water supply problems

Assured water supply points are available in about 4 lakh villages in the country from where village people draw their daily drinking water requirements from the dug wells, rivers, rivulets, canals, handpump tubewells, piped water supply schemes *etc*, but in most of the cases the drinking water is not safe. There are still another about 2 lakh villages in the country which do not have water supply points in them or in their close vicinity. Arrangements are, therefore, to be made to supply drinking water to such villages during the sixth 5 year plan period (1980-85).

It is necessary that before water supply projects are taken up, the village communities should be motivated to participate in them. They could contribute their share in cash or in kind which can be anything from 5 to 25 per pent depending upon the type of scheme. Rest of the funds should be made available by the State Governments or Zila Parishads. When the schemes are completed and are passed on to village panchayats to manage them, they should make arrangements for employing the mechanics/operators.

Summary, conclusions and recommendations.

Appropriate models for the sanitary disposal of human excreta and supply of safe drinking water to the people have already been developed as a result of researches carried out on them by a number of agencies. Much work on hardware has been successfully accomplished but lot of work remains to be done on softwares. Transfer of appropriate technology presents a serious challenge. Suitable infra-structures have, therefore, to be built up which may create necessary awareness and develop on urge in the local communities that they may accept such models and utilize them. Further research on sociological aspects appears necessary.

Experiences are available on the successful pilot projects with the active involvement of the local communities both for the sanitary disposal of human excreta and for safe drinking water supply. Experiences are also available to show that the local panchayats have been quite successful and effective in running and maintaining the piped water supply schemes for periods extending up to 10 years and over. What is needed is the implementation of pragmatic plans in which people participate effectively from the very inception and take up the responsibility of running such projects

effectively when completed, in the interest of their own health and that of the coming generations.

There is need to have an organisation at the apex level responsible for the formulating and laying down policies and procedures, for raising resources for materials, personnel and finances in order to provide direction and supervision to the environmental programmes. The apex body should have administrative and technical staff to help in programme planning, coordination of field activities, providing guidance monitoring, and development in the various stages of implementation. Existing training centres should be utilised for training various categories of workers required in the programme.

Another option would be to have an autonomous Rural Reconstruction Board/ Corporation under the Ministry of Health and the local government. The representatives should be drawn from the various concerned departments and social organisations. The Corporation/Board should mobilise resources from the Government and local bodies, supplemented by additional resources from financial institutions at low rate of interest repayable in easy instalments. In order to assist the Board/Corporation, in the planning, development and implementation of the programme as well as in monitoring and evaluation, there should be a technical wing for the collection, processing, guiding the programme at the field levels. It should have a team of adequately trained and experienced staff to attend to all such activities.

There is need to have a sanitation wing in the Health and Engineering Departments of the State Governments for the promotion, development and implementation of the environmental sanitation programme on a suitable scale.

Persons who accept the programme must be contacted systematically. Establishment of sanitation workshops at Parimary Health Centres, Udyogs/Cooperatives *etc.* in the blocks will help popularise the programme. Sophisticated technology which is widely and effectively used in the urban areas having sewage systems has no place under rural situations where the appropriate technological models of simple types of hand flushed latrines with waterseals provide the correct solutions. They are cheap, handy and fit in suitably in the socio-economic fabric of the rural communities. The latrine parts are simple and can be fabricated at the village level. This work can be source of employment to the rural people as has been demonstrated effectively by the working of Panchayat Udyogs in the state of U.P.

For villages in plains of northern India, the cheapest and the simplest method of ensuring safe water supply to rural communities is through the sinking of handpump tubewells. Wear and tear in the handpump tubewell machines occurs frequently due to excessive drawing of water. The Indian Mark II handpumps developed with the assistance of UNICEF are quite strong and sturdy and are found to be quite suitable for community use.

Introduction of piped water supply schemes should be encouraged for such villages or cluster of villages which have a population of 5000 to 10,000 and above and where the local people are enthusiastic and be prepared to contribute some

money, effort and time for the effective implementation of the schemes.

Provision of a simple and cheap drainage system should also be introduced for the proper disposal of water from the houses and community stand posts. This aspect should invariably form a component of a water supply system irrespective of the fact whether the scheme is for rural or urban communities.

Development of an organisation at the local level is necessary for the operation, collection of revenue and maintenance of safe water supply schemes. They should be supported with a programme of continuing education about the various benefits of safe water supply schemes. Motivation and making people agereeable to accept water facilities in their homes preferably through house taps should, as for as possible, be encouraged.

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Technological needs for India's rural development

Devendra Kumar

Centre of Science for Villages, Wardha

Our villages

A village is defined as a place where people largely live by land. Indian villages like the stars in the firmament cannot be changed from where they are. The distance between our villages is determined by the distance at which bullocks can manage the farthest field from the farmer's place of residence. This being a constraint, the number of villages will largely remain constant. All villages are not of the same population. The number of small (S) villages with a 1000 population or less are 78·5 per cent, medium (M) villages with population between 1000 and 5000, 20·5 per cent and big (B) villages of 5000 to 10,000 or more population 1·1 per cent. Thus every M village has 4 S villages and 20 such M village groups throw up a big Bazaar B village. These three systems of villages, small, medium and big can also be termed as Satellite, Mandi and Bazaar, respectively. These three types of villages instead of being such where the larger exploits the smaller should be made complimentary to each other. When we think of bringing new technological inputs in these villages, the S-M-B nature of village smust be kept in mind. There are certain inputs which are for all the village[8], there are others which will be required to be placed at medium level villages and still others may be optimum at B level only. Thus the big, medium and small strategy is necessary if we want to bring in new techniques to bear upon the rural economy; both for getting the benefits of the inputs permeate to the smallest village as well as for dividing the weight of any technology, which is too heavy for the small villages, on a wider base.

With these matrices let us apply ourselves to technological needs, for India's rural development. The villages of the three types have been losing the average days of gainful employment and thus impoverishments and disparity in comparison with the cities has been increasing. This is not due so much to increase in population as due to erosion of existing crafts and trades which are not able to withstand the competition of centralised urban based industries with all the infrastructural supports which makes them thrive at the cost of rural industries. Rural development therefore requires such techniques as will bring more days of work for the village people. These inputs are to be such as do not widen the gulf between the rich and poor, but help to bridge them. Usually these inputs tend to assist the have class to procure still more for them. This need not be happen if planning

is loaded in favour of the weak. Herein we are taking some of the most important areas where technology ought to assist without delay. These are some of the non-land based, non-traditional avenues, which the landless people can avail of and which will help build a better base for the oppressed and depressed.

Energy and fuel

At present the village is dependent mostly on the bullock and manual power for draught power; and on twigs and wood for fuel. To get the village other sources of energy and fuel, as even the poor can avail of, is a way to mitigate its misery and to avoid destruction of its tree vegetation renewable resources like biogas, solar wind and micro-hydel should be harnessed. Amongst these biogas is the most common and easily workable. The difficulty why it could not be utilized for full and hardly 80,000 gas plants could be installed in 20 years has been that the cost of construction of a 100 cu. ft. gas plant @ Rs. 40 cft. came to Rs. 4,000 which is equivalent to one year's earning of a village family. If we plan to have at least half of the total households in the villages energised by biogas in this decade and the other half in the next decade (and we have enough cowdung and night-soil to get the gas necessary for our kitchen) we would have to proceed in two ways. One is by having one biogas plant of one thousand cft costing less than Rs. 10,000, *i.e.* Rs. 10/cft. It can supply gas at the rate of 50 cft. per day for the requirement of every family in cheap plastic or rubberised cloth bags of 25 cft capacity to be refilled both times of the day. To these plants can be connected 4 or 5 lavatories sufficient for the 20 families. The night soil will be directly fed into gas plant and anaerobically treated. We have found in Wardha that there is no inhibition on the part of villagers in using in the kitchen the gas coming out of these gas plants sing cowdung and night soil.

The other is to have a 60 cft gas plant for houses where for some reason the bigger plant cannot supply the fuel. These can be built of big mud pots joined together at cost of Rs. 600 (*i.e.* Rs. 10/cft). In both these patterns the inputs are such as are within the means of the villages as it is four times cheaper than the traditional ones and so will have a large multipliability. With some governmental support through a net work of 'biogaswallas' as an infrastructure at S-M-B levels of villages, a proper strategy can be built up. The *Biogaswalla* (artisan in biogas) will be in all the villages and support provided to them from bigge M and B villages. Sanitation, energy and manure, all the three aspects can be taken together in their occupations.

The digested manure that comes out of the gas plants can be used for making compost manure out of agro-waste and vegetational fibrous material (collected in the village) to 40 times its weight. A high quality fertilizer of 1 per cent nitrogen content can be obtained within 100 to 120 days by a process which will give employment to a large number of people and will make the villages self-sufficient in their requirement of manure. By this, from every pair of bullock's cowdung (25 kg), 1 ton of 1 per cent N manure can be is produced every day. In the process the countryside will become free from weeds, leaves and other refuse which will go in the industry of manure making. Gobar gas

plant cum manure making can become the top level health giving and remunerative economic activity of the village and should be given the first priority in rural technological needs. It will—(*i*) manage safe disposal of night soil, (*ii*) provide cooking gas to the kitchen and save women's drudgery and forest wealth (*iii*) procure organic fertilizers for the fields by an ecological method, (*iv*) help clean all the garbage and refuse, agricultural waste and weeds, which will be required for making manure (*v*) open up new avenues of employment.

Amongst the other energy sources the solar energy can be utilised for cooking by two easy methods (*i*) paraboloid pulp basket with silver foil surface to concentrate solar heat by reflection on the cooking pot hanging on a tripod at the point of focus, (*ii*) wooden box with inside blackened and top fitted with double glass heat trap to allow sun's rays to go in but restrict heat coming out and thus creating an oven. With the free sun abundantly available to almost 80 per cent of the villages for more than 300 days in the year, India can show how this sophisticated field of energy can be harnessed for the common man's kitchen. With biogas support, solar cookers are ideal addition in rural technology and all that can be done to make them acceptable in rural economy need be done.

At the same time their age old wood burning stoves, *choolhas* shall also have to be improved with the application of the draught system by increasing temperature, eliminating smoke and facilitating of cooking in more than one pot simultaneously thus saving fuel and time. All these, however, need to be adapted to local conditions and methods of their acceptance by the rural community have to be evolved.

Rural housing : Sanitation and water

The other technologies needed are in the field of housing, sanitation and drinking water. The housing problem in the villages has become very acute because the area of village land earmarked for housing purposes a few hundred years ago, remains much the same whereas the population has expanded with time. The area of habitation in the village will have to be increased and more land brought in for that purpose encroaching upon agricultural fields. The housing requirements of the village population require cheap and health giving techniques. The present craze for going in for brick or cement concrete housing cannot help the poor in the villages. There are many known methods by which mud walls can be made non-erodable and other structures made from locally indigenous material. Central Building Research Institute, Roorkee, has done good work in this direction. More multi-disciplinal approaches in regard to housing would be necessary. Various tree branches and agricultural crop residue like stem of cotton, *arhar* or *tur etc.* can be used as wall reinforcement and partition. Floor can be made from baked mud tiles and the ceiling with such cylinderical tiles which can fit each other in an arch roof which does not need wooden understructure. Wood is another scarce material which should be avoided as far as possible and techniques evolved where the least of timber is necessary. The thatch straw or leaves if they could be safeguarded against fire could be good insulating roof materials. Work in this field has been done which requires further experimentation and application.

As there will always be need of some cementatious material at least for bath room, kitchen *etc.* where water flows, the Centre of Science for Villages has been able to make such a cement substitute by grinding in a Ball Mill, slaked lime with pozzolanic materials like paddy husk ash, fly-ash or brick-powder. This cement can be made in a village and has wide application. The potentialities of mud mortars of different kinds have also to be explored. Housing for villages, somebody has rightly said has to tend to be not only 'low cost' but 'no-cost'.

In sanitation, the disposal of effluents from the household and the wells comes first. In this the soak pits can play a very important role. What we have to do is not only to propagate a technique but evolve a method to convert the technique into an occupation of some people in the village whose economic interests coincide with that of the society. Soak-pit making, repairing and maintenance could be such a profession in which two families could be engaged in an area of 4-8 villages *i.e.* the area of a M (Mandi) village and its S (Satellite) villages. An economic base for a family which will look after say a100 soak pits in the households and 20 wells in the area will have to be worked out. We will also have to assure that there is no stagnant pool of water in the area and that the present village drains serve only as storm water drains. For this some land shaping may be necessary. All these techniques need exploration.

Regarding drinking water which is the human need of the magnitude next only to air. Let us not neglect the village-well, a point of social meets and exchange of news and views, dreams and inspirations of the community. Instead of thinking of taking water to every house let us have safe drinking water at these community points. This will also save, infrastructural costs and waste of water as here people will have to carry water in the pitchers to their houses. The well water can be kept clean by cheap chlorination pot methods. If filter candles fitted to earthen mud pots in the homes could do the job that should also be tried.

The well keeping is another job which should be created. To keep the water safe, the water drawing pulleys fiitted with ball bearing oiled or the hand pump in repair and the premises kept clean must be made the responsibility of one particular family which could be given contract for this work in the village.

There will have to be a link up between S-M-B levels of villages for safe drinking water strategy so that one helps the other and yet the independence of each is kept intact. Facility of testing of drinking water should also be provided. The principle to keep at the 'B' level sophisticated instruments and equipments which are helpful for the big area but are needed only at times, the less sophisticated at the 'M' level and simple tools of daily necessity at 'S' level should be followed and appropriate technology evolved.

Preliminary experiments in storage of rain water for drinking in mud pots stacked by the side of outer walls which collect the rain water from the roof has been successful. In problem villages a 20′ wall of 6 ft height, made of inter-connected mud pots and one lower pot fitted with a tap, can store 5000 liters of water at the cost of Rs. 1·50 per 10 litres of storage *i.e.* in Rs. 750/-. This could be tried in most of the one lac problem villages and

safe drinking water made available for 100 problematic days @ 50 litres/day/family. This and similar lines need exploration.

Other needs

Communication is another example of an important technological input that the villagers require. The development of (*a*) simple telephone system, based upon radio waves, to villages nearby, which can communicate with a point in the town to get them the necessary information or facility can be very helpful. These are necessary in times of crisis like illness, fire, catastrophes, *etc.* and economic transactions for the villages to know whether their agriculture product can get a fair price if they bring it to the town. Telecommunication is an essential need of the community cut off from the rest of the society which needs to be met.

However, when the village requires S and T inputs most is in finding out new avenues of employment for the unemployed and underemployed people. For them we have to find out methods by which raw materials available in the village which are not utilised at present could be used for some economic production.

Interaction of S and T bodies

Among the various national laboratories in the country, one finds clues to such techniques in a larger number, we have to pick them and convert them into village trades. For example CFTRI, Mysore, has fabricated a small machine by which leaf cups can be made without any sewing of the leaves by twigs. Here the leaf is hot pressed into the shape of a leaf cup used for eating. The Regional Research Laboratory, Jammu, has evolved a method of making pulp from agricultural wastes like cotton stalk, banana stem, pine needles *etc.* from which thick boards are lifted by handmade paper making techniques and these are pressed in a hot hydraulic press to convert them into hard boards which could replace wooden planks in many requirements. The Regional Research Laboratory at Jorhat has evolved a technique for the utilisation of odouriferous plant materials, in producing essential oils in the villages.

Similarly scores of techniques can be found on the shelves of various laboratories. These are not used because they may not be suitable for the urban entrepreneurs and have yet to be adopted to the conditions in the villages and converted into an industry for the people there. This development requires a constant interaction between scientific laboratories and village conditions.

We have a large number of scientific institutions in the country : Medical colleges, Engineering colleges, University level scientific institutions, full fledged universities and National research bodies. All these together make a large repository of S and T. Unfortunately their interface with rural India has not been developed. The result is that the benefits of science and technology have not been able to percolate to the level of the poor and we still have 48 per cent people living below the level of subsistence. This great challenge has to be met by the scientific community and a mechanism evolved by which these institutions could fulfil the responsibility of utilising their research capabilities for rural India. We should make a well concerted and consolidated move for this by having a time bound programme of identifying techniques which can bring hope in the life of those who have lost all hopes.

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Employment generation for primary health care

M.C. Swaminathan

National Institute of Nutrition, Hyderabad

With the increasing realisation that health of the people is an important component of developmental process, Health for All by 2000 A.D. as a national goal has been accepted, by both developed and developing nations[1]. In India, there has been a considerable expansion of the primary health care system as a result of the recommendations of the Bhore committee in the early forties. The coverage of these services is even now inadequate to meet the basic health needs of the communities. Several studies have indicated that hardly 10-20 per cent of the population have the benefits of this system. This has largely been due to lack of adequate infrastructure in terms of men, material and money associated with inadequate utilisation of these services by the communities.

Realising the inadequacies in the current health care system, several attempts have been made to improve the situation. Several models, and innovative methods utilising various types of resources both local and external have been attempted by various official and voluntary agencies, to suit the local conditions. The recent workshop held on Primary Health Care[2] reviewed most of the studies on a countrywide basis and the evaluation of this experience indicates that our attempts to extend the primary health care to all should necessarily follow the following principles :

(*i*) Utilisation of locally available resources; (*ii*) Community participation; and (*iii*) Minimum cost.

The implementation of the community health volunteers scheme in 1977 is based on these considerations and evaluation of the programme, though not very encouraging, indicates that there is scope for improvement of the services, so as to reach the goal of health for all, with emphasis on preventive aspects of health care.

Scope for employment generation

Since the programme for health for all aims at improving the infrastructure and outreach, it can be expected that it will provide scope for income or employment generation at all levels. The easiest approach to the whole problem would be in terms of extending the present primary health care services by additional inputs like staff *etc.*, so that the coverage is extended. This not only requires an enormous cost, but is also likely to lead to administrative problems in relation to training *etc.*, and the element of community participation would be limited. The second approach of utilising community health volunteers has been

indicated above, but in terms of the employment or income generation, at the present moment it has limited value since the concept is voluntary services supported by government assistance. The ideal approach would be to have a system based on self-reliance and community support where the cost of the programme will be borne by the community. In this, there is also scope for additional inputs by the government agencies to meet the needs of the sections of people which cannot afford to pay for the cost of services rendered.

The present discussion on employment generation is largely based on this last approach.

Components of primary health care and employment potential

The components of primary health care which provide scope for generation of employment are listed in the Table. The three types of activity under primary health care where there is scope for employment are marketing and supplies, delivery of services and production units. Under marketing and supplies are included the entire range of products and other aids for meeting the primary health care requirements of the community. Drugs for the care of minor ailments, contraceptives, orosol, nutritious supplementary foods, aseptic kits *etc.* can be made available in the community through individuals and groups, through the medium of village shops, cooperatives, youth clubs and *mahila mandals*. There is also scope for local production of some of these supplies.

Under delivery of services, the poor attention given by the existing services to preventive health care and environmental sanitation needs to be taken note of. Other health promotional activities should include motivation for family

Table. Primary health care—generation of employment

Type of activities/work	Type of health care	
A. Marketing/Depot/Supplies :	Care of minor ailments	Drugs *etc.*/orosol/antimalarials
Village shops/Cooperatives/ Clubs	Family planning	Aids
	MCH	Sanitary kits
	Nutrition	Supplementary foods
B. Delivery of services :	Care of minor ailments	
Community Health Workers, CHV, ST, *Dai*	Family planning	Motivation
	Environmental sanitation	Disinfection of wells
	Nutrition	Distribution of iron and folic acid, vitamin A.
		Weighing new born, children and adults (ANC)
C. As labour/work force :	Reporting of vital events	
Food for work (NREP)	Health education	
	Environmental sanitation	Drainage, soak pits, latrines, wells

planning and MCH care, distribution of nutrients and monitoring of health status by periodic weighing. Health education forms an important component of these services.

The most important component of primary health care which has enormous potentiality for employment is the utilisation of labour work force for various activities connected with primary health care particularly in works relating to constructions, improvement of environmental sanitation, disposal of waste and improvement of water supplies *etc.* Thus the 'Food For Work Programme' or. 'National Rural Employment Programme' as it is now called, offers scope for employment generation particularly of the needy section, through activities related to development of infrastructure for primary health care.

It may be relevant to point out that these potential activities for generation of employment have already been in operation in many situations, though on a limited scale. What is emphasised is an expansion of these existing activities, (modified, if necessary, to suit local conditions). Some innovative areas could also be explored for generation of employment. For example, the potter could be trained to develop aids for improving environmental sanitation, both at the household as well as at the community level.

Mode of payment

Since the main principle is least cost as well as payment for services, a discussion on the mode of payment is necessary since all the sections of the population in the rural areas would not be in a position to fully utilise these services available in their own villages for economic reasons. The needs and resources should be assessed and the plan for generation of employment should be designed with the help of the community. Moreover, in the rural areas particularly, payment in cash could be replaced by other modes, for example barter systems *etc.* This is already being done in many parts of the country and this may also be utilised for payment in health services rendered by individuals or groups. The concept of a community chest, that is collection of donations from the people in cash or in kind, can also be utilised for improving the level of health in the community. Traditional forms of payment for services could be through sharing of produce, foodstuffs both cooked and raw, daily or annually. The encouragement of various modes of payment should take care of the health needs of the poorer sections in the community, if properly planned.

Development of models

The scope for generation of employment and type of services or activities developed will vary according to local conditions and the methodology adopted should be in accordance with the local needs and aspirations. There is scope for developing models and based on their usefulness these could be extended further. Testing should take into consideration not only the feasibility but also emphasise the links with the existing health care system and the need for providing services to all sections of the population with minimal cost. The parameters for evaluation should be carefully selected and emphasis should be on prevention

and promotional aspects of health care to communities.

It is proposed to undertake a study on the integration of health and nutritional services with the Food For Work Programme (NREP). The investigations will include assessment of the system of delivery of foods under the programme, utilisation of the food by the workers, health and nutritional status of the beneficiary population, availability and utilisation of health and nutrition services *etc*. Based on the results of these studies, models will be developed for delivery of health and nutritional services. The impact of these models over a period of time will be assessed. The study is expected to identify the scope for employment generation. It should also indicate how NREP can be used for creating assets and developing resources that will contribute to the improvement of delivery of health and nutrition services to the community.

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Social and health problems of women in rural India

Prabha Ramalingaswami

Centre of Social Medicine and Community Health,
Jawaharlal Nehru University, New Delhi

Health problems of women in rural India need a careful analysis and understanding of the issues involved. These have to be seen in the context of the social and economic structure and cultural milieu of Indian society. Most women in rural areas are victims of a vicious circle of abject poverty (In rural areas 50.82% of the population is living below the poverty line according to the draft of the VIth Five Year Plan)[1], illiteracy (In 1971 the female literacy in rural areas was 13·2%[2]. In the provisional tables for 1981 the All India figure for female literacy is 24·88%—the figure for the rural areas is not yet out)[3], early marriages (according to 1971 figures 13·6% in 10-14 age group and 62·2% in the age group 15-19 are married)[3], frequent pregnancies (the total marital fertility rate is 6·82)[4], and abortions and infant deaths (134 per thousand)[5]. While the status she is accorded is nothing to speak of. Her role in the family is crucial as she has to carry the burden of family's poverty, cope with the health problems of the family, and put up with social norms, customs and rituals. Because of these factors the women belonging to the poverty group in the rural areas are subject to more health hazards than their male counterparts.

Lack of basic health facilities in rural areas affect women much more as this can lead to maternal and infant deaths, complications which are the result of lack of help from trained midwives, severe anaemia due to undernutrition and frequent pregnancies. Table I brings this out clearly.

Table I. Maternal mortality rate per 100,000 live births (1972)

Cause of death	Mortality rate
Abortion	56·2
Eclampsia	46·2
Placenta praevia	30·1
Haemorrhage in delivery	30·1
Post-partum haemorrhage	36·1
Anaemia of pregnancy	50·2
Abnormal presentation	28·1
Puerperal sepsis	56·2
Not classifiable as above	84·3
All causes	17·6

From : Model registration survey of causes of Death—1972, Registral General, India, Pocket Book of Health Statistics of India, 1976

Because of the key role the woman has in contributing to population growth, population control programmes are usually directed towards her. In spite of the programmes for family welfare and

maternal and child health—maternal mortality continues to be high and so is the infant mortality rate. The population continues to grow as shown by the 1981 census provisional figures. The adverse female : male ratio of 935 : 1000 according to 1981 census is still distressing. One must note here that the ratio has begun to improve in 1971-1981 decade for the first time in this Century.

The bogey that the Indian women needs to be emancipated or that she must be given equal status with the men (like the slogans of the women's Lib Movement) do not really help the disadvantaged woman. In the same way efforts to give this group nutrition education with a view to change the dietary habits or preach a small family norm or attempts to impart health education to enable her to take preventive health measures will be futile. Because of the over-riding poverty of the family and lack of access to resources the woman in the disadvantaged group is just helpless. With a situation like this the question is how to help her and give her at least the basic health care. What the rural woman needs is *services* and *support*.

The government has a network of male and female basic health workers and now community health volunteers in some rural areas who function with a primary health centre as their base. In addition, there are *gramasevikas* who are attached to Block Development Office and whose job is to help the rural women. There are also many programmes for poverty eradication and rural development such as Integrated Rural Development Programme—National Rural Employment Programme, Minimum Needs Programme and Food for Work Programme *etc*. There are also programmes which focus around the child like the ICDS Programme and the mid-day meals programmes *etc*. Yet these programmes have not helped the woman in the most disadvantaged section of rural society. The same social forces that give rise to inequalities, imbalances, poverty and class structure of the society are behind this. The easy availability of trained *Dais* will go a long way in helping these women (Table II).

Table II. Position of *dais* training programme

Plan	No. of *dais* trained		
	Target	Achievement	%
IInd Five Year Plan	35,000	15,000	(42·8)
IIIrd Five Year Plan	20,000	12,000	(60·00)
IVth Five Year Plan	40,000	16,500	(41·25)
Vth Five Year Plan	98,240	72,399	(73.69)

It is gratifying to note here that the Vth and now the VIth Five Year Plans are putting more emphasis on *dai* training.

While the expeditions from paramedical workers are very high, the budget that is spent on training them and in paying their salaries is meagre in every state. The less said the better about the conditions under which they work, the support they get from PHC and their service conditions in general.

Health problems of women in rural areas have to be seen not in isolation but as a part of the problems faced by women belonging to the most disadvantaged section of society. The most crucial

problem of this group is sheer lack of purchasing power due to stark poverty. Efforts should be made to help her to earn an extra income which she can call her own and which she can divert towards health activities.

It is not that the woman is not working. She may be a wage earner or she may be working on the marginal farm which the family has or she may be working very hard in her family just doing the domestic chores. Whatever be the situation she should be strengthened to make extra money which she can call her own and which she can use as she likes. This should be done in such a way that her role in taking care of her children and her family is not disturbed. It is expected that when the woman is supplementing the income of the family in this way, she will try to put the extra income in health activities for her children and family.

There have been many studies in the health field which have focussed on women's health problems and which have come out with suggestions and plans for an integrated Maternal and Child Health Care and Family Planning Services[6]. A few studies have undertaken economic programmes in addition to health activities[7–13]. There have been attempts to help the women by social reforms. Most prominent among them are Raja Ram Mohan Roy[14,15] and Maharshi Karve[14–17]. Mahatma Gandhi with his disciples like Durgabai Deshmukh[18], Sushila Nayar and Soundaram Ramachandran[19] who have made pioneering efforts to help the woman and raise her status. There are also economic programmes which focus on women such as the Self Employed Women's Association[20] which organised the street vendors of Ahmedabad, the Lijjat Papad Organization[21] to mention a few. Most of these projects have unusually motivated persons who organised them and it may be difficult to reproduce them.

When we are talking about appropriate technology for primary health care—the most crucial problem is how to reach the woman in the disadvantaged section of rural India and how to render her health care and how to involve her in health activities. As ill-health is one of the many problems which she faces and as the root cause of many health problems is poverty, the best way to render health care for this group is through a combined programme of health and part-time economic activities. The system that is to be devised should be such that it will have a fair chance of success under normal conditions prevailing in rural setting. For this the essential strategy that is proposed is to use the women in the community to help the other women through vocational training programmes for part-time economic activities and by rendering basic health care. The next question is how can this be achieved.

The existing health workers and village level workers like ANMs and *Gramasevikas* will have to be used as much as possible. However, because of the large population they have to cover and also because of the social structure prevailing in villages the existing workers are not readily available to the poorest section. It is because of this reason that the community health volunteer scheme has come into existence. The report of the ICSSR and ICMR–*Health for All*[22]–rightly points out that "if only one community health volunteer is to be placed in a village then the volunteer should be a women rather

than a man since most of the important village level health activities concern women". The present position is that there are too many male community health volunteers and far too few women community health volunteers.

While the idea to select persons from the community who will serve the community on a part-time basis, is an excellent proposition, insofar as the health problems of these women are concerned, a different training programme needs to be developed. The present training programme emphasizes on the medical and health problems only. The content of training progarmme for community level women health volunteers should not only consist of basic skills in handling general maternal and child health problems and family planning information but also vocational skills to teach part-time economic activities. They will have to be familiarised with the developmental activities in the block and should be encouraged to establish contact with the existing personnel from the Block Development Office so that part-time economic activities could be well organised. A new type of organisational set up which integrates health and developmental activities has to be developed. This system has to be such that the co-ordination between health and economic activities is achieved as a matter of routine and does not depend on exceptional individuals. The health centre, the centre for marketing the produce of the economic activities and a fair price shop where nutritious food-stuffs are sold at a reasonable rate will all have to be either under one roof or very close to each other. The type of part-time economic activities to be encouraged will have to be determined taking into account the local needs and availability of raw materials *etc.* The training programme will have to make a provision to give this training at sub-centre villages if it helps in attracting women from this section of society who will go back and serve in the upliftment of these women. In addition, the whole organization has to be geared for this challenging task.

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Primary health care—case for multiple delivery networks

A.K. Jalaluddin

National Council of Educational Research and Training, New Delhi

During the last three decades there has been considerable diffusion of the primary health care facilities and services in the country. However, in spite of more than five-fold increase in the per capita expenditure of medical services, health and family planning[1], the infrastructural facilities tended to concentrate at isolated growth points in the urban and rural areas and the utilisation of the services essentially confined to the traditional beneficieries. The growth of the primary health care services and facilities under the existing delivery systems seem to indicate an emphasis on the quantitative aspects, meaning 'more of the same' on the tacit assumption that an investment planning for growth by itself could take care of the anomalies and disparities in the distributive aspects and the utilisation pattern of the health services.

Human and organisational factors

It has by now been amply demonstrated that area wise equitable distribution of resources does neither necessarily lead to uniform utilisation of the inputs by all sections of the people nor to comparable performances of the departmental delivery system in terms of conversion of the inputs into desired outputs even if the quantitative targets are considered as valid indicators. Differences in the organisational behaviour and quality of leadership of the State-level health delivery systems are to a great extent responsible for the variations in their performance. This aspect of the organisational factor is gradually being appreciated at the national level health administration, particularly in view of the perpetual poor performance of some of the states in fulfilling the targets of family welfare programmes. But what is not adequately appreciated are the facts that even those states which are known for better performance would not be in a position to generate on its own mass participation of the rural population in medical and health care and family welfare programmes through large scale involvement of medical and paramedical personnel and social workers who are outside the organisational network of the departmental health services. The community health volunteer scheme, while constituting a positive step to bridge the gap between formal governmental structures of health services and the unorganised and informal population in the rural areas, may not qualitatively improve the situation without a supportive and independent community-based institutional structure.

As the CHV scheme is being implemented now, the involvement of the community is marginally confined to the recommendation of the name of the CHV, who otherwise is treated as a subordinate governmental functionary by the medical officer of the primary health centre. For all practical purposes the CHV happens to be a lone individual without any day to day contact with an organisational network which could inspire, motivate and guide him to do the job assigned to him[2]. In the absence of such an arrangement, the scheme may ultimately degenerate into an ineffective appendage of the departmental health delivery system, as it happened in the past with several other similar government schemes. Another important point needs to be considered in this context. Our rural community due to the load of poverty and mental intertia and non availability of medical and health services within easy reach are by and large indifferent not only to the preventive aspects of health care but also to the common ailments until a patient reaches a critical state. To most households in the rural areas the practice of health care virtually means 'crisis management'. In this context, the need to link health care with adult education, therefore, becomes quite obvious. It has also become evident through decades of our experience in adult education and community service that health services without any educational programme to sensitise the community do not make much headway. Similarly, adult education without any provision to satisfy the health needs of the learners generally proves to be less motivating[3]. Adult and community education thus becomes an essential instrument for social marketing and management of medical and health care programmes in the rural areas. It is also important to note that both these programmes together provide the natural background for introduction of population education and family planning programmes in the rural areas.

Economics of household health care

It is the general experience of social workers that an awareness of the economics of personal medical and health care is also a source of motivation of the prospective participants. The economic components of health care measures can be broadly categorised under three heads : direct cost of curative medicine and treatment; indirect savings through adoption of preventive measures; and higher productivity leading to higher income as a result of reduction in morbidity. As the returns from the preventive and promotive measures are generally considered to be too intangible and remote by the rural population, these measures may not immediately catch their imagination or adequately motivate them for spontaneous participation. Moreover, the rural population by and large prefer to consult private medical practioners, avoiding the public medical and health care system, in order to get personalised services even though they have to pay through the nose[4]. It is, therefore, but natural that any medical and health care programme in order to become more acceptable to the rural masses should be able to provide curative medical care with a human touch at a reasonable cost. There is a genuine feeling among the rural poor that whenever medical care is provided free, the attitude of the medical personnel becomes more

impersonal and that it is the more articulate section of the population which generally encash such facilities. The above situation has several ramifications.

Since curative health services constitute an important entry point for social marketing of health and family planning education and services, the role of the community health volunteer needs re-examination. In the prevailing situation, where the curative treatment ('injection' for crisis management) is a felt need in the community, the CHV inspite of his initial reluctance may virtually succumb to the temptation of becoming a rural doctor. This, in fact, is happening in some villages.

Mismatch between demand and supply

In the present rate of diffusion of primary health centres and sub-centres, referral services, hospital beds and quantum of medicine for free distribution, the tremendous degree of mismatch that exists between their supply and demand at present is likely to continue beyond the year 2000 by which we are committed to ensure health for all citizens[5]. If the rate of population growth continues to remain as it is today, the pressure on the existing public health services is likely to intensify in the less developed areas not only in quantitative terms but also in qualitative terms due to environmental degradation, malnutrition, *etc.* Therefore, the present strategy of multiplying the primary health centres, sub-centres and CHVs to meet the challenge of a fast growing population through a package of uniform services in a cross-cultural setting seems to be grossly inadequate and unrealistic. In the light of the resource and organisational constraints, particularly trained manpower and community-based delivery mechanism in the rural areas, the role of the non-corporate private sector in medical and health services, both traditional and modern, needs to be re-examined to explore the possibility of inducting this sector under an autonomous structure outside the State Health Departments on the basis of shared social responsibility. This is important in view of the greater reliance shown by the rural population on the private practioners, both traditional and modern, notwithstanding the higher costs involved. It would also be unjust to brand the non-governmental medical profession as a body devoid of any social commitment. It is quite possible that with the creation of an appropriate climate and provision of specific roles and incentives, an autonomous umbrella structure created by the government may organise local medical and health care projects on the basis of part-time participation of professional and social workers trained for the purpose in the areas which are remote from the existing public medical and health care facilities. The professional associations of medical and paramedical personnel can also play an important role in mobilising the vast professional manpower to provide technical and logistical support services to such auxilliary delivery system. Such joint ventures with a socially committed leadership may offer a viable management alternative in delivering health and medical services in the rural areas by promoting greater participation of the rural community and appropriately linking incentives with the performance and productivity of the field level functionaries. Such a professional management systems is likely to be more efficient, cost-effective, flexible, dynamic,

field-oriented and aware of its accountability compared to the existing departmental formal structures.

The present partnership arrangements

The existing government schemes of financial assistance to voluntary agencies working in the field of health, social welfare, education, culture, *etc.* happen to be an appropriate step in the direction of decentralisation and democratisation of the delivery system. Under such schemes, some of the well known missionary and voluntary agencies manned by professional medical personnel, paramedical workers and community health volunteers have proved to be the best examples of low-cost and community-based, innovative health and medicare management system. However such partnership arrangements are also not free from serious limitations. Most of the voluntary agencies involved in providing health and medical care at the micro-level under collaborative arrangements with the concerned government departments have very little say in the macro-level planning and management of such programmes. As a result, the innovative practices and programmes initiated by these agencies at micro-level do not in general get institutionalised for replication in a wider scale. Very often it is said that the success of a micro-level experiment much depends on the quality of the workers and the leadership involved and as such it is rather difficult to multiply their number in any planned manner. While endorsing the above view with reservations one cannot but highlight the importance of making the necessary distinctions between the selective and mass approaches to planning and implementation of social programmes. In a mass programme, the creation of organisational units at grassroots and networking them are as important as designing and sustaining the individual units. Here the emphasis should therefore, shift to institutionalisation of new leadership training, management practices and restructuring of the incentive and reward patterns in favour of the desired behaviour of functionaries within the organisational network. Obviously, a formal governmental structure cannot be visualised to be the agency responsible for creating such local level organisational units and providing them the required umbrella.

Under the present arrangement every non-governmental agency interested in a scheme is supposed to approach the concerned department individually and, if approved, enter into a traditional form of donor-recipient relationship for implementation of a fixed package of programmes. Speaking statistically, the total population presently covered under such partnership arrangements may not constitute more than a few per cent of the target population. However, inspite their present limitations, such collaborative arrangements at the micro-level have by and large been found to be comparatively more effective and full of potential for eventually throwing up a partnership arrangement for planning and management of health care and family welfare programme at the national and state levels. In view of this potentiality, the non-availability of community-based voluntary organisations in a major part of the rural areas should not be taken as a *fait accompli* and as the reason for relying exclusively on the departmental medical and health services as a soft option.

The problem of creating and sustaining a massive network of community-based organisational units for implementation of health, medical care, and family planning programmes can be handled only through a combination of different strategies. Utilisation of all existing facilities, professional and paraprofessional manpower and exploitation of the deep rooted sense of social responsibility among many institutions, social organisations and individual citizens should be the philosophy behind such an approach. There is so much of work to be done to motivate and to involve the vast majority of the masses in the rural areas in the heath care programmes that it would be unreasonable to believe that any one particular procedure of diffusing such programmes would be exclusively suitable to meet the challenge. In fact, multiplicity of organisational networks for promotion and implementation different elements of the primary health care programmes do provide an opportunity to diversify the method of reaching the rural population with location—specific packages of health care programmes. Responsibilities of these networks could also be divided broadly to cover the educational, preventive, curative, social security, and logistical aspects according to the competence and resources of the different networks.

Possible supportive networks

Educational institutions in each state may conveniently consitute a suitable network for the promotion of primary health care programme. Regular activities organised by each school in this area may be incorporated in the existing courses of 'Work Experience' or 'Socially Useful Productive Work'. The schools and colleges may also be encouraged to provide specific community activities in their neighbourhood under the guidance of teachers trained for the purpose. Local medical colleges, primary health centres and other professional agencies may be entrusted with the responsibility of proving training and guidance to the schools and colleges for organisation of promotional activities. The departments of Social and Preventive Medicine in the medical colleges may adopt rural areas not only for the purpose of providing opportunity of practical professional training to the medical students in these areas but also for developing an institutional linkage between the medical college and rural educational institutions on a permanent basis for promotion of community health programmes as it is now done in some of the Asian countries[6]. While several such projects have recently been introduced in some centres of medical education and research, the survival of these attempts is still linked with the personal commitment of the individual programme coordinators. What is urgently needed is institutionalisation of these efforts and widening of the leadership role of the medical colleges and medical research centres in community health programmes. A linkage at the national level between the centres of medical education and research working in community health programmes may be facilitated by the Indian Council of Medical Research through organisation of consultation meetings, seminars and workshops, documentation, and action and policy research.

Establishment of consortia of voluntary agencies working in the areas of rural

development, health care, social welfare, adult education, women's programmes, tribal welfare, *etc.* may provide a strong linkage between these agencies at the national and state levels with a view to project their contribution to social, economic and cultural development of the country and also to make their field experiences available in the formulation of national development plans, specific programmes and schemes. Such consortia may also provide facilities for the training of young social workers for the purpose of setting up local voluntary agencies in the rural areas.

There have been some isolated attempts in the recent past to form such consortia. The consortium of voluntary agencies covering most of the well known agencies working in Chota Nagpur Division of Bihar happens to be an experiment in the above direction. One of the most important outcomes of these attempts to bring the voluntary agencies working at the micro-level to a macro-level platform has been found to be an enhancement of their awareness of the national problems and concern for a much wider approach to the solution of the problems of socio-economic development. It is quite possible that such consorita would be in a position to develop area development plans in collaboration with the concerned government agencies and to implement such plans independently under contractual arrangement with the government incorporating necessary safeguard conditions like external evaluation. Such umbrella level structures would also be in a better position to weed out unscrupulous agencies from the field and to develop a participatory monitoring mechanism.

New areas of professionalisation

As it is well known, primary health care programmes are directly and indirectly related to several other developmental activities in the rural areas. Supply and maintenance of drinking water, waste disposal, construction and maintenance of latrines, immunization services, social marketing of contraceptives and preventive medicines, social organisation of health and awareness camps, *etc.* happen to be some of the important areas in primary health care which are not directly related to the medical profession. However, any health care management system in order to be effective in the rural areas should have a vested interest in generating professional expertise locally by involving the surplus manpower, particularly the unemployed and underemployed educated youth, in training programmes. Training in the areas of social entrepreneurship and self-management of local social projects may constitute a vital input into the process of modernisation in rural society. It is mainly through such action-oriented training programmes, in contradistinction to the theory-oriented formal education, a scientific temper and culture can be gradually introduced.

It is generally believed that a meaningful coordination between the different developmental agencies dealing with activities relating to primary health care may be brought about by laying down necessary procedures and issuing instructions, *etc.* However, inspite of such efforts, inter-agency cooperation at the grass roots remains a far cry. One should, therefore, be able to identify alternatives to the above solution so that professional-

isation of the non-medical inputs into the primary health care programmes could be coordinated.

Many rural level social workers have experienced that when a nucleus of an organisation is formed consisting of the beneficiaries of any development or co-operative programme at the village level, it is much easier to make the development functionaries representing the concerned agencies to sit together and coordinate their activities and channelise the resources through local initiative. The diary development cooperatives recently established in some parts of the country happen to be a successful macro-micro level coupling ensuring a high degree of professional competence generated at the village level. The success of this experiment is mainly due to the utilisation of the market forces for the creation of a demand for the programme and organisation of the prospective beneficiaries. We thus come again to a situation when the limitations of a bureaucratic governmental structure in bringing about such qualitative changes in the rural economy become quite obvious. In the light of the above prospects, a cooperative sector, initially set up with public finance and community resources, may also be visualised as an auxiliary primary health care delivery system. Once such cooperative efforts become commercially competitive, the public health system should be able to provide them with a viable market instead of extending its infrastructure into the areas covered by such cooperatives.

Health insurance for unorganised workers

Organised workers and urban middle class, being the most vocal sections in the society, have been able to secure for them several health and medical care measures either free or at very nominal cost, whereas the rural poor have practically very little access to similar facilities. Any attempt to handle the problem of providing curative medical services to the rural workers, who live at or below the subsistence level, as an integral part of the overall policy on medical services for the rural areas as a whole would be to evade the issue of equalisation of opportunity. So long a disproportionately high pressure from the more influential and articulate section of the population exists on the public medical care and hospital facilities, the rural poor is likely to remain underserved, particularly in terms of their participation in the indoor hospital facilities[7]. In the circumstances, any policy favouring larger allocations exclusively to the primary health centres and subcentres for providing indoor beds would virtually mean a continuous growth of government consumption expenditure at the cost of the nominal benefits of the most deserving sector of the population.

A way out from the above contradition would be to frankly accept a dual medical care financing policy. While deliberate attempts should be made to divert the free medical services under the public health system to the remote areas and to the underserved populations, a separate autonomous network may also be promoted to provide medical services at a moderate or subsidised premium. This alternative system for delivery of comprehensive curative medical services in the rural areas can also be visualised as a health insurance measure. In this arrangement, the premium could be fixed at differential rates to give maximum

financial benefits to the most disadvantaged section of the population. Interpreted in another way this policy would mean that the government should be prepared to help certain low income groups to buy medical services at a reduced rate from a socially controlled market. The insurance network set up by the government may take the form either of a public sector or joint sector undertaking with a professional management structure served by panels of doctors, outdoor dispensaries, hospitals, mobile facilities *etc.* and a number of part-time local agents at the community level.

Some of the rural schemes designed to provide relief and seasonal employment to the landless farmers and other categories of rural workers may also make provision for issuing vouchers, encashable only as health insurance premia, either as part payment of their allowance/wages or in addition to their allowance/wages. The very acceptance of the idea of investing for the future and for unforeseen development by the rural population would be a major step in helping them to overcome their mental inertia and fatalism. Health insurance agents in the community, whose incentives should be linked with their performance, would be a permanent source of motivation for the prospective beneficiaries.

It may not be necessary to provide a blanket health insurance coverage to every rural household initially. More emphasis may be laid on their voluntary participation so that the expansion of the coverage of the scheme could also be related with the motivation of the individual households and its social demand from the different sections of the society.

As the management of the above undertaking would be autonomous, it can afford to be institutionally dynamic and a pace setter in the social sector. It is also likely to be more sensitive to its public accountability mainly because of the openness of the system to public scrutiny and the ease with which its performance could be measured and publicly debated.

Keeping the long term interest of the rural population in view, such autonomous undertakings, unlike the government health departments, would be in a position to mobilise local resources to provide appropriate residential, schooling and other community facilities in the rural areas to attract qualified doctors and other supporting staff from the urban areas. Such undertakings should in fact, have a better claim to institutional credit.

Counselling and guidance for family planning and related clinical services could also be a major area of social marketing which the above undertakings should be able to handle more successfully in view of their day to day contact with a large number of community based health insurance agents and motivators.

Policy implications of supportive networks

A national policy on health and population, while indicating the social objectives should also analyse the sociological aspects and possible alternative strategies for implementation of plans and programmes. We are yet to develop such a comprehensive health and population policy. However, this should not be taken as a serious hindrance if the health authorities are prepared to evolve a meaningful

policy on the basis of practical experiences of successes and problems of failure not only in the field of public health but also in other areas of development. Very often the actual problems in the field, like lack of adequate motivation and participation of the underprevileged sections of the populations in health and medical care programmes are sought to be interpreted simplistically as problems relating to lack of resources or administrative lapses at the lower level. The defensive mechanism within the existing delivery system has a tendency to believe that what is 'desirable' is also 'achievable' without any change in policy. When confronted with facts and figures highlighting the reality of the situation in the field, functionaries at the higher levels tend to rationalise the situation by suggesting that any departure from the present practices would call for 'structural changes' in the socio-economic set up. In the circumstances, it would be almost futile to expect that the need for augmenting the governmental efforts in health and population programmes through creation of supportive delivery network would be articulated by the health administration itself either at the centre or in the states. The Planning Commission also does not seem to be equipped at present to analyse the problems of failure of the rural development, health care, population, elementary and adult education and other social sector programmes designed to bring about equity and social justice. Inspite of itself bringing out some revealing evaluation studies, the Commission is yet to identify the policy implications of the problems of failure in the field. It may be due to the reluctance of the development planners to visualise the minimum needs and other social programmes as countervailing and out-of-turn measures for restoration of social harmony and balance as distinct from the philosophy followed in the economic development programmes where social benefits are expected to "tricle down" from the growth of national income[8].

However, with the growing frustration as a result of mismanagement of social programmes, some development professionals tend to advocate either greater governmental control over such programmes or "mass mobilisation." They seem to forget that neither bureaucratisation nor politicisation of social programmes would be in conformity with the present transition needs of the Indian situation. Unlike most of the smaller developing countries, India's development has reached a stage when it would be quite naive to ignore the prevailing market forces while planning measures for accelerated social development. Government as the major investor in the social sector in India can in fact socially generate and regulate the flow of health and other social services by introducing appropriate financing policy and delivery mechanisms. Many developed countries in Europe and North America had to adopt dual financing policy in the health sector during such transition periods when the organisational limitations of the public delivery system became obvious through growing government consumption expenditure and inefficiency. In this context, our situation seems to be more comparable to late nineteenth century Europe than most developing countries. The analogy seems to be more valid in view of the comparability of the political systems and institutions of Western Europe and India.

One need not be ashamed to highlight the fact that much of the success in our agriculture in the recent years is due to the credit and subsidy policy adopted by the government in favour of creating a market demand for the high yielding variety of seeds and the new agricultural practices. This policy on agricultural financing, when coupled with the required technical support service, produced the desired results. However, the agriculture administration very often tend to undermine the importance of the agricultural financing and pricing policy without the support of which most of their extension and technical facilities might have remained unutilised.

The creation of new public sector undertakings and utilisation of private sector initiative in the delivery of materials and services and marketing of produce are some of the innovations worth noting in the context of the present dilemas in formulating health policy and implementation strategies. It may also be noted that through the setting up of these vital supportive delivery systems some of the ticklish issues in Centre-State relations were by passed.

The situation in the health and population sector is somewhat analogous to the situation in agriculture as it was in mid-fifties. However, the main difference between the two situations lies in the fact that while the rich farmers were considered to be the main stay for the success of the Green Revolution, the key to the success of a future Health Revolution lies in the hands of the rural poor. Given a dynamic health policy and realistic delivery networks, a breakthrough in primary health care and population control may not be a distant reality.

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Appropriate technology for primary health care : Non-formal health education at the family and the community level

Shakuntala Bhatnagar

Centre for Community Medicine, All India Institute of Medical Sciences, New Delhi

Education in all forms of non-formal learning systems as a means of redeeming the goal of Health for All by year 2000 is discussed. After independence, the government made sincere efforts both for universalization of primary education for children between 6-14 years and functional literacy for adults. In spite of all the efforts, the literacy level rose only marginally. There is a heavy educational wastage at primary level, in tribal and rural areas, urban slums and particularly in girls. The broad reasons for educational wastage are economic and social as well as attributes of educational systems themselves. The rigidities of formal school systems, with single point entry, sequential learnings and fixed hours, keep away many who might otherwise have cared to become literate. Formal education seems to have run into a crisis of faith. It seems irrelevant to the learner and irrelevant to the society. Being divorced from life-situations it has managed to cultivate an unreal set of values in the youths by creating a small elitist class separated by chasms of non-understanding and non-communication with the common man.

Several attempts have been made in last three decades to correct this dichotomy of irrelevance and to integrate education with the peoples' total needs and goals of society but such attempts have only helped to consolidate the indifference of the rural society. What is needed now is to complement the efforts of a rigid education system by strengthening non-formal education which is not restricted by bounds of age, calculated learning periods and distressing examinations. Non-formal education is necessary for all, and for all times to come. The concept of non-formal education should never be regarded as second hand and second rate education. In fact, successful implementation of non-formal education will prove to be more effective, useful and functional in rural areas and also prepare some for formalised schooling systems.

The education through non-formal methods is not a new phenomenon. In olden days the *Gurukuls* and other educational institutions were not meant for imparting literacy only but children used to cultivate knowledge through work

experiences related to various needs of life. In modern times an explosion of knowledge due to scientific and technological advancement has made the education system more sophisticated, impractical and unrelated to daily life.

To revive the non-formal systems the government and non-governmental organisations have introduced several educational programmes with varying emphases. The programmes that may be mentioned are :

1. Non-formal education for age group 6-14 years for school drop-outs
2. Non-formal education for young men and women between the age of 15-45 years
3. Functional literacy for age 15 upwards linked to developmental schemes
4. Programmes for urban workers
5. Programmes by non-educational agencies
6. Programme of continuing education by the universities
7. Library services for reinforcing non-formal education
8. Satellite Instructional Television Programmes.

While the formal educational systems completely ignore the teaching on health aspects, almost all the non-formal systems advocated a full contingent of knowledge on personal hygiene, nutrition of mother and child care, environmental sanitation and control of communicable diseases.

Three essentials of non-formal education should be fully realised in any programme.

(*a*) The identification of learner and environmental needs;

(*b*) The diversification of curriculum to meet those needs;

(*c*) Relating the programme to practical situation so that the message can be indelibly transmitted.

Adult education was given the status of a national programme in October, 1978, with basic objective of introducing literacy through the help of school teachers students, village youths, retired personnel, and by producing voluntary social workers. The ministries of education, agriculture and information and broadcasting joined hands in preparing the appropriate programmes. Information on health topics was given a high priority.

Several other forums, *mahila mandals balwadis* and mobile creches are the outreach for non-formal education in the rural areas and have been used for health education and for family planning not only by health workers but also by the non-health workers.

Research studies assessing the benefits derived from the non-formal education to children and women were largely conducted by the NCERT and Indian Social Institute and Directorate of Non-formal and Adult Education. Some of the conclusions drawn from these studies indicate that high concentrations of drop-outs are in the poverty striken areas and any effort towards non-formal education should be necessarily related to socio-economic development programmes and income-producing work experiences, if the children are to be induced in education system. Further, the educational programmes may not be restricted to any age limits. Sufficient evidence has also been collected to support that language, intellectual development and school

readiness are significantly enhanced by preschool education in children.

The *Grahini* training programme used several approaches in Madhya Pradesh and Bihar for non-formal education of young women and tribal and rural girls in mother and child health care, home nursing, first aid, personal hygiene and nutrition along with multiple facets of family life and agriculture. The evaluation of *Grahini* trained girls reflected significant superiority in their day to day practice of clean personal habits and child rearing practices against their untrained counterparts. They appreciated the importance of balanced food, and introduced proper weaning foods to the infants at the right time.

The ICDS programme launched in 1975, presently running in 200 blocks, has placed major emphasis on non-formal education for the preschool children as part of the package for the total development of the child to be delivered by the *anganwadi* worker. Nutrition and health education to women of all age groups, by both *anganwadi* workers and the health worker is another service provided. The education of women has been given prime importance and functional literacy has been adopted in the Integrated Child Development Scheme more thoroughly and the *anganwadi* worker is involved here too. The functional literacy programme focuses on three aspects.

(*i*) Heightened accent on certain women's roles which primarily affect the family life, which include home management, maternal and child care, elements of health and hygiene and food and nutrition; (*ii*) Social and cultural factors which prevent women from socio-economic participation and keep them in a state of subservience; and (*iii*) To foster faith in their own strength and self-reliance.

Future approaches and possibilities

We have to consider firstly, how health education can become a confirmed component of existing systems of non-formal education. Secondly, we have to detail how health education can be rendered non-formally; to be exact informally, at family and community levels by more and more people. Lastly, we have to see how advanced techniques in audio-visual communication can be used in promoting non-formal systems.

To answer the first, the curriculum and course content for functional literacy and adult education in each geographical area should be drawn out according to local beliefs and endemic health and environmental problems. Public health doctors should also participate in the training of trainers of non-formal workers. Non-formal forums like *mahila mandals* should be addressed by the local health workers and even doctors periodically.

India's greatest asset is its people. A potentially vast human resource are the students, who have been fortunate enough to reach middle and higher secondary levels in the villages and colleges and universities in the towns. They can be guided to involve themselves in village health activities as part of their practical exercises in social studies. This will amount to introducing a non-formal educational channel within the structured and rigid courses of the schools, by modifying the curriculum considerably and will preclude careful study and reorientation of

educational systems for the rural areas. It is expected that maximum resistance may be offered by the teachers.

Students from middle schools and high schools in rural areas should be allotted 15-20 families individually or in groups in their own village or urban slums for health education. The girl students may be given projects on *anganwadi*, *balwadi* or *mahila mandals* or in the village creche, where they can assess the needs, prepare the material and provide the health education. This work experience should bring credit in their annual assessments. These work experiences will also prepare the students to accept health vocations in future.

The university and college students should adopt rural or urban slums and should be able to screen some health problems through home visiting and organising exhibitions. The students can undertake continued health education on one hand and concentrate their activities through health camps on the other. The endeavours of National Social Services, who are already making efforts in this direction, should be augmented greatly and be carried out more intensively.

Another potential area, which has been little explored yet is informal health education to patients and their relatives in the hospitals, dispensaries, primary health centre and other centres by involving them in almost all the patient care activities, like personalised or general health care, nursing, food preparation and distribution, maternal and child health, family planning, old age care, routine drug regimens, *etc*. Such suggestions need tremendous organisation and dedication.

Health education is not a prerogative of health workers and all village level workers regardless of their work should be given an orientation. This orientation should be brief, to the point, possibly through a precise and calculated health message for each activity, which can be learnt and reproduced by the workers at the family rounds. The role of *dai* in mother and child care needs no emphasi in nonformal system.

To evolve the community level health education, the role of mass media and preparation of resource materials is of fundamental importance. There is a tremendous need for making small films on health themes, and making them more catchy and interesting. It is not necessary to evolve the theme around the health primarily, yet the moral can be directed towards health. Some such possible topics could be disablement due to polio, road accidents, blindness and malnutrition. It should be a challenge for the Ministry of Information and Broadcasting and professional film makers to develop as many films as they can, may be even regular feature films or short documentations. Rural or urban, old or young, all love to see films. The television and radio should blend the themes on health in their social features and dramas. Health talks and interviews given by professionals are too formal, too general and stereotyped and invariably do not relate to the poeples' perceptions.

It is suggested that institutions involved in non-formal health education, like Literacy House, should undertake preparation of a large amount of educational material. Help of artists, cartoonists and professional advertisers may

be sought to make the messages loud and attractive.

Slides and movie projectors and short films should be made available at all the primary health centres. According to Prof. Amulya Reddy energy required to run these projects can also be attained from biogas plants.

Health education through non-formal ways can only be given by non-formal workers like good parents who tend to educate children at any time of the day on any life situation, whenever the occasion arises.

List of participants

Dr Apte, S.V.
Deputy Director-General
Indian Council of Medical Research
New Delhi 110029

Dr Arole, Mabel
Comprehensive Rural Health Project
Jamkhed 413201
Dist. Ahmednagar

Dr Arole, R.S.
Director
Comprehensive Rural Health Project
Jamkhed 413201
Dist. Ahmednagar

Shri Athalye, S.T.
Financial Adviser
Indian Council of Medical Research
New Delhi 110029

Dr Ayres, D.
Appropriate Health Resources and
Technologies Action Group (AHRTAG)
85 Marylebone High Street
London, W1M3DE, UK

Dr Bagley, V.M.
Central Health Education Bureau
Kotla Road
New Delhi 110002

Dr Bajaj, I.D.
Director-General of Health Services
Nirman Bhavan
New Delhi 110001

Shri Bakshi, N.S.
Deputy Secretary
Ministry of Health and Family Welfare,
Nirman Bhavan
New Delhi 110001

Shri Bali, J.S.
Adviser,
Voluntary Health Association of India
New Delhi 110016

Dr Basu, R.N.
Assistant Director-General
Directorate General of Health Services
Nirman Bhavan
New Delhi 110001

Dr Bhatnagar, S.
Associate Professor of Community
Medicine
Centre for Community Medicine
All India Institute of Medical Sciences
New Delhi 110029

Shri Bhushan, V.
Deputy Secretary
Ministry of Health and Family Welfare
Nirman Bhavan
New Delhi 110001

Dr Chatterjee, Meera
Ford Foundation
New Delhi 110003

Shri Chawla, Anil
Department of Rehabilitation and
Artificial Limbs
All India Institute of Medical Sciences
New Delhi 110029

Shri Choudhury, S.
Senior Research Fellow
Centre for Community Medicine
All India Institute of Medical Sciences
New Delhi 110029

Dr Datta Banik, N.
Assistant Director-General
Indian Council of Medical Research
New Delhi 110029

Dr Deodhar, N.S.
Director
All India Institute of Hygiene and
Public Health
110, Chittaranjan Avenue
Calcutta 700073

Shri Desikan, K.V.
Director
Central JALMA Institute for Leprosy
Tajganj
Agra 282001

Dr Devendra Kumar
Director
Centre of Science for Villages
Magan Sangrahalaya
Wardha 442001

Dr Dutia, Gopal
PSC Officer
United Nations Children's Fund
South Central Asia Region
UNICEF House
New Delhi 110003

Dr Elliott, Katherine
Assistant Director
The Ciba Foundation
41 Portland Place
London WIN 4BN

Dr Gambhir, I.S.
Research Officer
Banaras Hindu University
Varanasi 221005

Dr Ghosal, B.C.
Director
Central Health Education Bureau
Kotla Road
New Delhi 110002

Dr Gill, J.S.
Assistant Professor
Centre for Community Medicine
All India Institute of Medical Sciences
Ansari Nagar
New Delhi 110029

Dr Gothi, G.D.
Director
The New Delhi Tuberculosis Centre
Jawaharlal Nehru Marg
New Delhi 110002

Smt Grewal, Serla
Additional Secretary and
Commissioner (FW)
Ministry of Health and Family Welfare
Nirman Bhavan
New Delhi 110001

Dr Gupta, A.K.
Research Officer
Indian Council of Medical Research
New Delhi 110029

Dr Gupta, N.P.
Senior Deputy Director-General
Indian Council of Medical Research
New Delhi 110029

Shri Gupta, V.K.
Public Relation Officer
Indian Council of Medical Research
New Delhi 110029

Dr Haxton, D.P.
Regional Director
UNICEF
Jor Bagh
New Delhi 110003

Dr Jalaluddin, A.K.
Professor
Department of Education in Science and Mathematics
National Council of Educational Research and Training
Sri Aurobindo Marg
New Delhi 110016

Dr Kamala Rani
Senior Research Officer
Indian Council of Medical Research
New Delhi 110029

Dr Khandpur, R.S.
Head
Medical Electronic Instruments Division
Central Scientific Instruments Organisation
Chandigarh 160020

Dr Kocker, James
Ford Foundation
Lodi Estate
New Delhi 110003

Dr Kutranon, S.
Regional Adviser
Community Health Services
World Health Organisation
New Delhi 110002

Dr Lesar, J.
USAID
U.S. Embassy
New Delhi 110021

Dr Luthra, U.K.
Senior Deputy Director-General
Indian Council of Medical Research
New Delhi 110029

Dr Malhotra, U.
Senior Research Officer
Indian Council of Medical Research
New Delhi 110029

Shri Mani, C.V.S.
Additional Secretary
Ministry of Health and Family Welfare
Nirman Bhavan
New Delhi 110011

Dr Medappa, N.
Senior Research Officer
Indian Council of Medical Research
New Delhi 110029

Dr Mehrotra, N.
Department of Biochemistry
All India Institute of Medical Sciences
New Delhi 110029

Dr Mehta, Suman
Research Officer
Institute for Research in Reproduction
Jehangir Merwanji Street
Parel, Bombay 400012

Dr Misra, B.S.
Director
Central Bureau of Health Information
C-533, Nirman Bhavan
New Delhi 110011

Dr Mukherjee, A.K.
Head
All India Institute of Physical Medicine and Rehabilitation
Haji Ali Park
Bombay 400034

Shri Mukherjee, P.N.
Deputy Director-General
Indian Council of Medical Research
New Delhi 110029

Smt. Mukherjee, R.
Centre for Science and Environment
807, Vishal Bhavan
New Delhi

Dr Mutalik G.S.
Director
Development of Comprehensive Health Services,
World Health Organisation
World Health House
New Delhi 110002

Shri Narain, K.
Secretary
Ministry of Health and Family Welfare
New Delhi 110001

Dr Natarajan, Nalini
Indian Institute of Public Administration
Ring Road
New Delhi 110002

Shri Natarajan, R.
Joint Secretary
Ministry of Health and Family Welfare
Nirman Bhavan
New Delhi 110001

Dr Nath, L.M.
Professor
Department of Community Medicine
All India Institute of Medical Sciences
New Delhi 110029

Dr Nayar, S.
President
Mahatma Gandhi Institute of Medical Sciences
Sevagram
Wardha 442102

Dr Nugent, D.A.W.
WHO Programme Coordinator
World Health Organisation
Nirman Bhavan
New Delhi 110011

Dr Ohlin, Hellen
Programme Officer
Swedish Embassy
New Delhi 110021

Dr Pandit, C.G.
National Institute of Virology
Pune 411001

Dr Phatak, L.V.
Director
Birla Institute of Medical Research
Kherapati Colony
Gwalior, 474001

Dr Ragini, Prem
Banwasi Seva Ashram
Govind Pur (via Turra)
Mirzapur 231221

Dr. Rajagopalan, P.K.
Director
Vector Control Research Centre
5/38, Lenin Street, Kosapalayam
Pondicherry 605011

Dr Ramachandran, K.
Associate Professor and Head
Biostatistics Unit
All India Institute of Medical Sciences
New Delhi 110029

Dr Ramachandran, L.
Director
The Gandhigram Institute of Rural Health and Family Welfare
P.O. Ambathurai R.S.
Madurai District 624309

Dr Leela Rama Kumar
Director, Research in Medical Education
Show Room 22, Sector 7
Chandigarh

Dr Ramalingaswami, P.
Chairman
Centre for Social Medicine and
Community Health
Jawaharlal Nehru University
New Delhi 110067

Dr Ramalingaswami, V.
Director-General
Indian Council of Medical Research
New Delhi 110029

Dr Raman, A.
National Environmental Engineering
Research Institute
Delhi Zonal Laboratory
Alipore Road
Delhi 110054

Dr Rama Rao, W.G.
Secretary-General
Indian Society for the Rehabilitation
of the Handicapped
Mayur, Ist Floor
377, V.P. Road
Bombay 400004

Dr Ram Das
A 28, Friends Colony
New Delhi 110014

Smt Uma Ramnath
A 32, Friends Colony
New Delhi 110011

Smt Rau, Parvathi
Field Officer
National Institute of Nutrition
Jamai Osmania
Hyderabad 500007

Dr Reddy, Amulya K.N.
Cell for the Application of Science
and Technology to Rural Areas
Indian Institute of Science
Bangalore 560012

Dr Roy, Somnath
Director,
National Institute of Health and
Family Welfare
New Mehrauli Road
New Delhi 110067

Dr Saigal, M.D.
Deputy Director-General of Health
Services
Nirman Bhavan
New Delhi 110001

Dr Sanjivi, K.S.
Vice-Chairman
M.A.C. Institute of Community Health
Voluntary Health Services Campus
Madras 600020

Dr Satyanarayana, K.
Production Officer
Indian Council of Medical Research
New Delhi 110029

Dr Satyavati, G.V.
Deputy Director-General
Indian Council of Medical Research
New Delhi 110029

Dr Saxena, B.N.
Senior Deputy Director-General
Indian Council of Medical Research
New Delhi 110029

Shri Shankaranand, B.
Union Minister for Health and Family
Welfare
Nirman Bhavan
New Delhi 110001

Dr. Sharma, V.K.
WHO
World Health House
New Delhi 110002

Dr Sharma, Monica
Senior Research Officer
Indian Council of Medical Research
New Delhi 110029

Dr Sharma, V.P.
Director
Malaria Research Centre
New Delhi 110054

Dr Sethi, P.K.
Professor of Orthopaedics
Rehabilitation Research and Regional
Limb Fitting Centre
S.M.S. Medical College and Hospital
Jaipur 302004

Dr Singh, H.
Professor and Head
Department of Preventive and Social
Medicine,
Government Medical College
Patiala

Dr Swaminathan, M.C.
Deputy Director
National Institute of Nutrition
Jamai Osmania
Hyderabad 500007

Dr Tewari, Amrit
Professor of Dentistry
Postgraduate Institute of Medical
Education and Research
Chandigarh 160012

Dr S.P. Tripathy
Director
Tuberculosis Research Centre
Spur Tank Road
Chetput
Madras 600031

Dr Udupa, K.N.
Emeritus Professor and Rector
Institute of Medical Sciences
Banaras Hindu University
Varanasi 221005

Dr Vaidya, Ashok B.
CIBA Geigy of India Ltd.
Research Centre
Post Box 9002
Bombay 400063

Dr Varma, S.K.
Head of the Department
Department of Rehabilitation and
Artificial Limbs
All India Institute of Medical Sciences
New Delhi 110029

Dr Vasudeva, Y.L.
Professor of Preventive and Social
Medicine
Medical College
Rohtak

Dr Verghese, B.G.
Gandhi Peace Foundation
221/3, Deen Dayal Upadhaya Marg
New Delhi 110002

Dr Vijay Kumar
Head, Department of Community
Medicine
Postgraduate Institute of Medical
Education and Research
Chandigarh 160012

Shri Vohra, N.N.
Joint Secretary
Ministry of Health and Family Welfare
Nirman Bhavan
New Delhi 110001

Dr Johnsen, Dennis O.
Scientific and Technological Attache
U.S. Embassy
New Delhi 110021

Dr Taskar, A.D.
Director
Institute for Research in Medical Statistics
New Delhi 110029

Dr Sriramachari, S.
Director
Institute of Pathology
New Delhi 110029